



Sylphon
TRADE MARK

THE Standard THERMOSTAT

Vital Factor
IN TODAY'S
EFFICIENT ENGINES

One reason why today's motor car engines out-perform and out-wear their predecessors is the Sylphon Thermostat. It maintains uniform engine temperatures by controlling flow of circulating water . . . automatically and accurately . . . makes possible the tight fits in engine parts demanded by modern engines . . . improves lubrication . . . helps to provide the amazing oil and fuel economy of the modern automobile engine.

Sylphon Thermostats, made by the world's largest manufacturer of self-contained temperature control devices, are simple, dependable, serviceable . . . the standard thermostat of America's leading motor car manufacturers.

THE FULTON SYLPHON CO.
KNOXVILLE, TENN.

March 25, 1939

When writing to advertisers please mention *Automotive Industries*

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AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 80

Number 12

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HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor J. B. POLLOCK, Asst Editor
JOS. GESCHELIN, Detroit Technical Editor MARCUS AINSWORTH, Statistician
J. A. LAANSMA, Detroit News Editor HOWARD KOHLBRENNER, Art Editor
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H. E. BLANK, JR., Asst Editor JAMES G. ELLIS, Washington Editor
B. M. IKERT, Contributing Editor

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C. A. MUSSELMAN, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZBY, Vice-Pres.

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AUTOMOTIVE INDUSTRIES

1st Quarter's Output Estimated at 1,038,000

**Production This Week
Totalled 83,000 Units**

Car and truck production for the week ending March 25 was expected to total approximately 83,000 units, according to estimates based on a mid-week check of factory schedules. This will represent a slight gain of approximately 1000 cars and trucks over the preceding week.

Slight increases in output anticipated during the week by several manufacturers were partially offset by a brief shutdown at Buick which lost part of a day's operations on Monday because of a labor dispute in the Fisher Body plant upon which it depends for bodies.

On the basis of figures for January and February, and the estimate for March, the industry's production during the first quarter of 1939 will be approximately 1,038,000 cars and trucks.

This represents the second successive quarter since the introduction of 1939 models that the one million mark has been reached as the final quarter of 1938 accounted for 1,012,700 cars and trucks. Since production of 1939 models began, more than 2,100,000 cars and trucks have come off the assembly lines, almost two-thirds of the 3,500,000 figure mentioned when the model year began.

There was little change during the current week of the relative standing of various manufacturers. General Motors divisions were expected to turn out slightly more than 35,000 cars and trucks, followed by Ford divisions with slightly more than 19,000 and Chrysler divisions slightly under 19,000. Among the independents, Studebaker and Nash showed slight increases while Willys-Overland expected a reduction.—J.A.L.

Automobile Parts Firm Building \$50,000 Plant

C. E. Niehoff & Co., manufacturers and wholesale dealers in automotive products, recently purchased a property 125 by 600 feet, on the north side of Chicago. Work has been started on a \$50,000 factory. The building, which will contain 20,000 sq. ft. of floor space, is to be completed during June.

Automotive Industries

AUTOMOTIVE INDUSTRIES Summary of Automotive Production Activity (Week Ending March 25)

BUSES Inquiries showing increased interest in new equipment, presumably to augment bus fleets to handle the New York and San Francisco Fair crowds, continue. Riding comfort, including air-conditioning equipment, have been specified by several large operators in asking for prices and delivery dates. There have been, however, no noteworthy changes in production activity in this field.

TRUCKS Production for the most part remains quite steady with dealer orders showing substantial rise. This is attributed to usual seasonal activity. One large manufacturer still behind on dealer stock believes it may be the middle of summer before production and sales are balanced.

TRACTORS A sharp rise in sales is noted. Factories in general working on a normal basis consistent with prevailing conditions in the agricultural field. Some trend this year for dealers to materially increase purchases of tractor accessories.

AUTOMOBILES A slight increase of 1000 cars and trucks over the previous week raised the total output this week to an estimated 83,000 units. The first quarter's production will be approximately 1,038,000.

MARINE ENGINES Distributors report a sharp gain in orders and increased interest as the opening of the boating season approaches.

AIRCRAFT ENGINES Backlogs are growing constantly, and most makers are producing on heavy schedules. Research and development work is progressing rapidly.

This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.

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GM's Plant Expenditures Totalled \$32,598,650 in '38

**Sloan's Report Reveals \$397,809,536 Spent in Past
Five Years to Maintain "Manufacturing Efficiency"**

General Motors Corp., for the five years ended Dec. 31, 1938, made a capital investment of \$397,809,536 to maintain its manufacturing efficiency and to expand its plants, as well as to provide tools, dies, etc., for its yearly product program, it was disclosed Monday by Alfred P. Sloan, Jr., chairman, in his annual report to the more than 389,000 stockholders. This capital investment does not include the expenditures made to continue the corporation's research and engineering activities.

In view of the fact that 1938 was a year of subnormal activity, Mr. Sloan explained, only such expansion programs as were in process during 1937 were completed in 1938 and the question of further plant development on a broad scale did not arise. However, gross plant expenditures totaled \$32,598,650 in 1938. In addition, the corpo-

ration spent \$33,321,096 for special tooling principally to bring into production its 1939 products.

The General Motors chairman pointed out that at the end of the year there were 389,509 stockholders, establishing a new fourth quarter record and approaching the all-time record of 403,282 in the second quarter of 1938. The previously published year-end record for the number of stockholders was for the fourth quarter of 1937, when there were 375,755 stockholders.

The report showed that the corporation in 1938 produced and sold to its distributing organizations throughout the world, merchandise with a net value of \$1,066,973,000. This compares with \$1,606,789,841 for 1937, a decrease of 33.6 per cent. In terms of units, the corporation produced and

(Turn to page 384, please)

March 25, 1939

Czechoslovakia Market Believed Lost to U. S. Car Manufacturers

A Natural Result of Abrogation of Trade Pact in Opinion of Washington Authorities

American automobile manufacturers will suffer a total loss of the Czechoslovakia market, in the opinion of Washington authorities, as a result of the abrogation by the State Department of the Czechoslovakia trade agreement. The step taken by the American Government followed the absorption of Czechoslovakia by Germany, which has no most-favored-nation treaty with the United States and therefore was never accorded tariff concessions granted other countries under the terms of trade agreements.

The trade agreement abrogation automatically will have the effect of increasing duties on American cars to a point where even if imports were permitted by Germany they could not now enter Czechoslovakia. Under the Czechoslovakia trade agreement the quota on American motor vehicles was increased to 1600 units and duties were decreased. The duty on passenger automobiles weighing over 1000 kilos (2205 lb.) was reduced from 43 cents to 27 cents per lb., and on truck chassis weighing 1500 kilos (3307 lb.) from 30 cents also to 27 cents per lb., provided the automobiles and chassis were imported complete with all their normal equipment. The truck bodies are made in Czechoslovakia. Similar benefits by way of duty reductions were granted to automobile replacement parts. Shipments of American automobiles to Czechoslovakia since the trade agreement was signed on March 7, 1938,

through January, 1939, totaled 249 valued at \$184,823. Trucks exported during the same period totaled 67 valued at \$37,956.

The Treasury order, effective April 22, imposing estimated countervailing duties of 25 per cent of the invoice value on "bartered" or subsidized goods directly or indirectly from Germany is not expected to have any appreciable effect on American automotive interests. Whatever retaliation Germany may take, it is not believed that it will be directed against American-owned automobile plants in that country, though they may have more difficulty in getting funds. From a point of self interest, Germany, it is believed, will continue to encourage operation of the plants in order to maintain export markets and build up foreign exchange.

Seek to Bar Firearms From Factory Disputes

The La Follette Civil Liberties Committee, which for more than two years has been investigating alleged strike-breaking activities, industrial espionage and private police systems of employers, recommended on Monday an amendment to the National Firearms Act to prevent the use of machine guns and gas bombs in industrial disputes.

The report was the last of a series to be sent to the Senate covering the committee's findings. It condemned the

purchase of arms as the result of "anti-union" motives on the part of employers and listed these companies as being heavy purchasers: Republic Steel Corp., the United States Steel Corp., the Youngstown Sheet & Tube Co., and the General Motors Corp. It also listed 80 corporations and associations, which it said form "the back-bone of large-scale industry in the country," as having purchased more than \$1,000 worth of gas during the years studied.

The committee is expected to submit further legislative proposals to Congress at this session.

Government Contracts for Transportation Equipment

Government contracts for transportation equipment, as reported by the Labor Department's Public Contracts Division for the week ended March 11, follow:

Cambridge Instrument Co., Inc., New York, \$48,784 for fuel mixture indicators; United Aircraft Corp., East Hartford, Conn., \$16,954 for aircraft overhauling and repairing; Fargo Motor Corp., Detroit, \$24,793 for automobiles; Steuart Motor Co., Washington, D. C., \$16,378 for automobiles; Warner Electric Brake Mfg. Co., Beloit, Wis., \$17,433 for electric brakes, and the Firestone Tire & Rubber Co., Akron, an indefinite amount for brake-band linings.

Electric Autolite Earnings Totaled \$1,836,149 in '38

In its annual statement to stockholders, Electric Autolite Co. reports that its January business was 188 per cent above a year ago and that the outlook for the first quarter of 1939 is "very satisfactory." At the close of 1938 the company had \$19,751,026 current assets against \$5,075,149 current liabilities. Net earnings amounted to \$1.53 a share or \$1,836,149 for the year's operations.

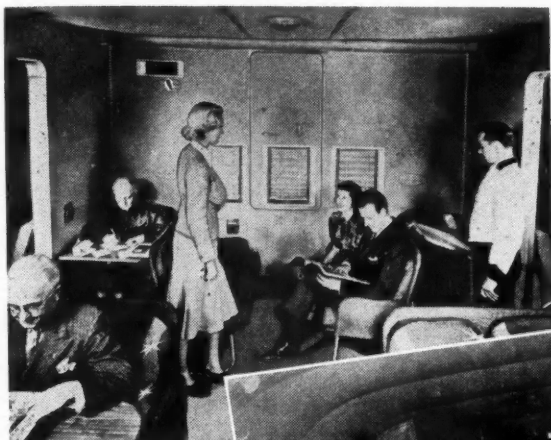
Royce G. Martin, president, stated that the company through research had augmented its line with two-tone electric air horns, spark plug cleaners, electric windshield wipers, and a new type electrothermostatic fuel level gage. The principle of the latter is now being applied to oil pressure and water temperature indicators. The company also is turning out a new stainless steel high tension ignition cable.

Pontiac Deliveries Well Ahead of Year-Ago Mark

Pontiac retail deliveries for the first 10 days of March were 4017 cars compared to 2967 for the same period of February, a gain of 35.4 per cent; and 2499 for the first 10 days of March last year, a gain of 60 per cent, ac-

New Passenger Car Registrations

	JANUARY 1939	DECEMBER 1938	JANUARY 1938	Per Cent Change, January 1939 over 1938	Per Cent of Total January	
	1939	1938	1938		1939	1938
Chevrolet	46,471	51,132	34,387	+ 35.0	22.88	23.59
Ford	37,541	37,914	36,280	+ 3.3	18.48	24.89
Plymouth	29,960	34,605	17,553	+ 70.5	14.75	12.04
Buick	15,838	18,446	11,292	+ 40.2	7.79	7.75
Dodge	15,587	17,041	7,870	+ 98.0	7.67	5.40
Pontiac	11,505	13,582	7,239	+ 59.0	5.66	4.97
Oldsmobile	11,419	14,021	6,764	+ 68.7	5.62	4.64
Chrysler	5,877	6,452	3,893	+ 51.0	2.89	2.67
Mercury	4,510	4,518			2.22	
De Soto	3,952	4,828	2,853	+ 38.8	1.91	1.96
Nash	3,900	3,695	2,820	+ 38.3	1.92	1.93
Hudson	3,560	4,689	2,909	+ 22.4	1.75	2.00
Studebaker	3,500	4,391	2,695	+ 30.0	1.72	1.85
Packard	3,088	4,210	3,474	+ 11.0	1.52	2.38
Lincoln	1,938	1,907	1,740	+ 11.4	.95	1.19
La Salle	1,794	2,369	1,080	+ 66.2	.88	.74
Cadillac	1,282	1,398	898	+ 59.0	.63	.55
Willys-Overland	978	1,117	1,369	- 28.5	.48	.94
Graham	350	406	546	- 36.0	.17	.37
Bantam	64	49			.03	
Hupmobile	61	62	82	- 25.5	.03	.06
Fiat	15	23			.01	
Miscellaneous	22	118	111	- 80.1	.01	.08
Total	203,212	226,973	145,765	+ 39.4	100.00	100.00
Chrysler Corp.	55,376	62,926	32,189	+ 72.1	27.25	22.07
Ford Motor Co.	43,989	44,339	38,020	+ 15.9	21.65	26.08
General Motors	88,309	100,948	61,570	+ 43.8	43.46	42.24
All Others	15,538	18,760	14,006	+ 11.0	7.64	9.61



The Yankee Clipper



Three views of the new Pan-American flying boat which will begin trans-Atlantic service this spring. (Top left) The smoking lounge. (Left) Control room with crew, left to right, H. Brock, navigation engineer; C. A. Lorber, captain; H. E. LaPort, co-captain; H. W. Beideman, radioman, and C. D. Wright, first engineer. (Above) View of the compartment where the flight engineering officer will watch the controls.

cording to figures released by the Pontiac sales department.

Inventories of new cars in Pontiac dealers' stocks March 10 were 29,467 compared to 27,492 the last day of February.

Used car sales held up well with a total of 8238 for the first 10 days of March compared to 8298 for the same period of February. Used car inventories gained only slightly during the 10 days from 29,557 the last day of February to 29,817 the tenth of March. This is in contrast with an inventory of 37,481 used cars on March 10 last year.

Sales Advance of 49.5% Reported by Chevrolet

Chevrolet dealers' sales of new cars and trucks turned sharply up during the first 10 days of March, as compared with a year ago. They totaled 23,447 units, a gain of 45.9 per cent over the 16,069 units recorded in the same period in 1938. They were also higher, by 6310 units, than sales for the final period in February of this year.

Lincoln Electric Co. Opens Seattle Branch

The Lincoln Electric Co. has announced the opening of a factory branch office in Seattle, Wash. The new office, with warehouse in connection, will be located at 1914 Utah Avenue. A large stock of electric welders, electrodes and supplies will be maintained

for serving the Inland Empire, Grand Coulee Dam and Alaska. J. B. McCormick, who formerly represented the company in Fresno, Calif., and recently in Spokane, Wash., will be in charge.

GM's Overseas Sales Up 9.9% in February

Sales of General Motors cars and trucks to dealers in the overseas markets during February totaled 33,330 units, representing an increase of 9.9 per cent over sales in February of last year. In the first two months of 1939, sales of 64,208 units represented an increase of 6.7 per cent over sales in the first two months of 1938.

For the 12 months through February, 1939, sales totaled 358,206 units, a decrease of 3.0 per cent from the volume in the 12 months ended February 28, 1938.

American Firms Led In '38 Tire Exports

While the United Kingdom led the United States by a considerable margin in number of tire units exported in 1938, American firms held the actual leading exports by reason of the fact that the bulk of Canadian tire manufacturing activity is controlled by American companies—Goodyear, Goodrich, Firestone and Seiberling all have extensive Canadian tire operations.

Tire units exported by the United Kingdom last year were 1,225,512. United States exports were 1,053,161

and Canadian exports numbered 719,222. France exported 504,399 tires and Germany 216,756.

The United Kingdom's two largest customers were British India and Denmark, taking 156,000 and 150,000 tires respectively. The new Fisk and Goodyear plants in Sweden which will supply all of the Scandinavian countries, probably will materially reduce United Kingdom exports to these countries, including Denmark.

Test Flight for Atlantic Service "Within a Week"

Cornelius Vanderbilt Whitney, board chairman of Pan-American Airways, announced after a White House visit on Tuesday that the first test flight on the projected trans-Atlantic air service probably will take place "within a week."

Whitney, who conferred with President Roosevelt on the proposed air service, said that the initial flight to Europe will be via the Southern Route, returning by way of the Great Circle Route with stops at Iceland and Newfoundland.

GM-Cornell Index Moves Down to 61

The General Motors-Cornell World Price Index of 40 basic commodities for the week ended March 11 was 61.0, compared with the previous week's figure of 61.1. The United States index in gold decreased 0.4 point.

UAW Report Shows \$2,116,639 Expenditures Over 18 Months

Balance of \$58,054 on Hand Dec. 31, 1938, Now Tied Up by Court Order

During the 18-months period ending Dec. 31, and preceding the split-up of the union into two groups, the United Automobile Workers Union spent \$2,116,639 against receipts for the same period of \$1,745,914, according to a report submitted by George F. Addes, secretary-treasurer, to delegates attending preliminary meetings of the UAW-CIO faction scheduled to open in Cleveland on March 27.

A balance of \$428,799 was on hand at the end of June, 1937, to protect this excess of expenditures over income but this balance had shrunk to \$58,054 on Dec. 31, 1938. Much of this balance is now tied up by court order pending decision by the court on suits filed by the two factions into which the union has split. Expenditures during the last six months of 1938 were \$570,121 against receipts of \$519,737.

The average dues paying membership during the 18-month period covered by the report was 197,800. In the struggle for rank and file support that has been waging between the contending factions it has been customary to refer to a total membership of 375,000, prior to the division.

The CIO-supported part of the UAW, headed by R. J. Thomas, has announced that it has filed a petition with the National Labor Relations Board requesting its certification as the sole bargaining agency for more than 50,000 employees of the Chrysler Corporation in all of its plants. The union's present contract with the corporation expires on March 31 and a request for a one-month extension has been made to which the corporation has made no announced reply. The corporation had previously announced that it would not negotiate with either faction of the UAW unless the other faction also was represented. Homer Martin, president of the independent UAW group, has refused to join with Thomas in the request to the NLRB for early action in deter-

mining which group shall bargain for Chrysler employees on the ground that Thomas had previously refused to conduct a referendum to determine whether members would support the Martin or the Thomas group. Martin also has insisted that the present court suit, filed by both groups, to determine which is the official UAW will have to be settled before the NLRB can make a decision.

GM's Report

(Continued from page 381)

sold throughout the world 1,307,749 passenger cars and trucks. This compares with 2,116,897 for the previous year, a decrease of 38.2 per cent. The manufacture and sale of the major products of the corporation other than

automotive likewise showed important declines.

During the year the corporation accounted for 42.9 per cent of the new passenger cars and trucks sold to consumers within the United States as against 39.0 per cent for 1937. A new all-time record of 44.8 per cent for passenger cars alone was established in 1938. General Motors accounted for approximately 35 per cent of the new passenger cars and trucks sold to consumers throughout the world, approximately the same as in the previous year.

Net earnings available for dividends on the outstanding preferred and common stocks amounted to \$102,190,007. This is equivalent, after paying dividends on the \$5 series preferred stock, to \$2.17 per share on the average number of common shares outstanding, and compares with \$4.38 per share for 1937.

There was distributed in dividends a total of \$73,564,641 during 1938, compared with \$169,728,081 for 1937. Regular dividends of \$5 per share were paid on the \$5 series preferred stock. Dividends on the common stock amounted to \$1.50 per share in 1938, compared with \$3.75 per share in 1937. There was retained in the business for its protection and expansion \$28,625,366, equivalent to 67 cents per share of common stock.

It was stated that the corporation maintained a strong financial position during the year. Net working capital at the close of 1938 was \$387,243,513, compared with \$347,216,116 at the close of 1937. Cash and cash items totalled \$242,895,320, compared with \$150,884,012 at the close of 1937.

Consolidated Aircraft Awarded Navy Contract

The Navy Department on Wednesday awarded a \$4,699,057 contract to the Consolidated Aircraft Corp. of San Diego, Calif., for an undisclosed quantity of airplanes and spare parts.

Dr. Bruce D. Campbell

Dr. Bruce Duncan Campbell, who had been chief physician and surgeon of all Ford Motor Co. plant hospitals for more than 20 years, succumbed to a heart attack on March 19. Dr. Campbell was 45 years old.

Stearman Develops New Twin-Engine Bomber

A new secretly-developed high-speed twin-engine attack bomber, the Stearman X-100, has been announced by the Stearman Aircraft Division of Boeing Airplane Co. Designed and produced at the Stearman plant in Wichita, Kansas, the airplane was built as an experimental model for entry in the Army Air Corps' attack bomber design com-

Calendar

Conventions and Meetings

The National Battery Manufacturers Association, Spring Convention, The Greenbrier Hotel, White Sulphur Springs, West Virginia May 11-12
American Foundrymen's Association, Forty-third Annual Convention, Cincinnati May 15-18
SAE World Automotive Engineering Congress May 22-June 8
Automotive Engine Rebuilders Association, Seventeenth Annual Convention, Baltimore, Md. July 5-7

Shows at Home and Abroad

Yugoslavia, Belgrade, Automobile Salon April 1-8
Great Britain, London, Automobile Show Oct. 12-21
Italy, Milan, Automobile Salon, Oct. 25 to Nov. 11
International Automobile, Motorcycle and Motor Boat Show, Budapest, Oct. 27 to Nov. 6
Great Britain, London, Commercial Automobile Transportation Show, Nov. 2-11
Great Britain, Glasgow, Scotch Automobile Show Nov. 10-18

Monthly Motor Vehicle Production (U. S. and Canada)

	PASSENGER CARS		TRUCKS		TOTAL MOTOR VEHICLES	
	1939	1938	1939	1938	1939	1938
January	291,444	168,890	62,502	58,262	353,946	227,152
February	250,897	151,133	61,244	51,464	312,141	202,597
March	186,341	.....	52,256	.....	238,597
April	190,111	.....	48,018	.....	238,129
May	168,599	.....	41,575	.....	210,174
June	147,545	.....	41,857	.....	189,402
July	112,114	.....	38,336	.....	150,450
August	61,687	.....	35,259	.....	96,946
September	69,449	.....	20,174	.....	89,623
October	192,906	.....	22,380	.....	215,286
November	335,767	.....	54,638	.....	390,405
December	341,524	.....	65,492	.....	407,016
Total	2,126,066	.....	529,711	.....	2,655,777

petition which opened March 17 at Wright Field, Dayton, Ohio. It is an all-metal high-wing monoplane.

The X-100 is powered by two 1400-hp. Pratt & Whitney R-2180 engines driving three-bladed, constant speed full-feathering propellers. It has a gross weight of approximately nine tons, a wing span of 65 ft., a length of approximately 52 ft., and an over-all height of approximately 12 ft. It carries a crew of four. Flush type rivets are used over the entire outside area of wings and body.

Advertising

K. H. Bronson, advertising director of DeSoto division, Chrysler Corp., has developed a robot-talking car, which is demonstrating itself to large Miami crowds prior to a nation wide tour. The car blows its horn, starts the engine, switches headlights off and on, starts the windshield wiper, tunes the radio, lifts and closes the hood, and opens and closes the doors without anyone inside. A record and three loudspeakers explain what is going on.

Cecil & Presbrey, Inc., Chicago, has been appointed agency of Perfex Corp., Milwaukee. Leroy A. Kling is the account executive.

Clinton T. Donnelly, formerly with Benton & Bowles, has been named sales manager of W. F. Transportation Co., New York, to sell advertising space in the company's buses and terminal.

Seven Steel Companies Seek To Restrain Minimum Wage Order

Ourselves and Government—A Check List Of Federal Action Corrected to March 23

DEPARTMENT OF LABOR

STEEL WAGES. Counsel for seven independent iron and steel producers in the East have filed an application with the United States Court of Appeals for the District of Columbia, seeking a temporary injunction pending an appeal, to restrain the Secretary of Labor from continuing the minimum steel wage of 62.5 cents which went into effect on March 1 for steel companies contracting with the Government. A temporary restraining order, granted on behalf of three of the companies, was terminated on March 13 by Justice Bailey in Federal District Court. The seven companies then petitioned the Court of Appeals for a stay.

FEDERAL TRADE COMMISSION

VS. GENERAL MOTORS CORP. Alleged false and misleading representation in advertising prices at which certain of their passenger cars are sold. Hearings resumed March 7 at Detroit. Trial examiner, John W. Addison; FTC attorney, James M. Hammond.

VS. GENERAL MOTORS. (No change.) The case, identified as the exclusive dealing case, involves the

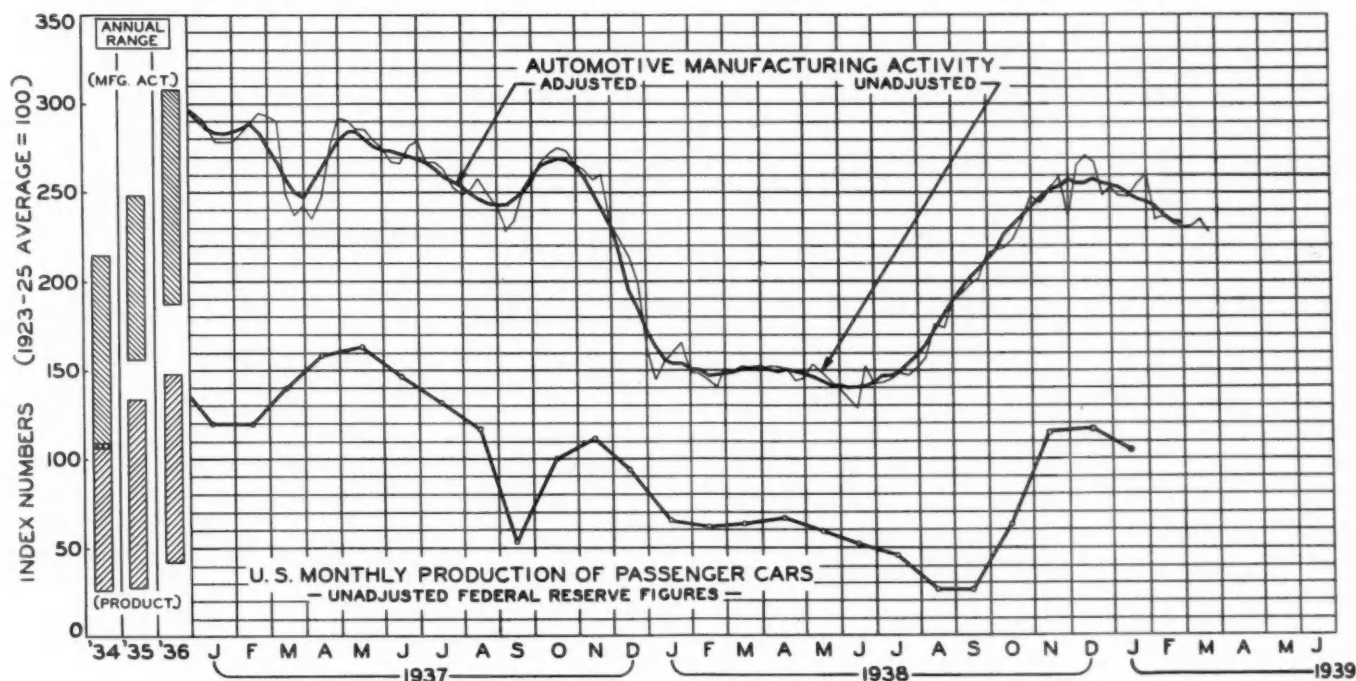
complaint that GM dealers allegedly are required to handle GM parts exclusively.

VS. UNITED STATES RUBBER CO. Respondents have asked for additional time to reply to the complaint and have been given until March 31. The FTC alleges unlawful price discrimination in the sale of tires in violation of the Robinson-Patman Act. Also involved is the United States Tire Dealers Corp., of New York, a subsidiary.

Lakey Foundry Reports Substantial Contracts

Operations of Lakey Foundry Machine Company, Muskegon, are being stepped up materially by releases on contracts recently received from two new customers, according to sources close to the company. A substantial order for motor blocks has just been booked from a large engine builder not previously supplied by Lakey. Work is already under way on an initial contract with another manufacturer for 25,000 castings, releases calling for 5000 units per week.

Unadjusted Index Reverses Again, Dropping to 229



For the week ended March 18 the path of the unadjusted index curve, traced by the light solid line on the above chart, reversed itself again to fall off five

points to 229.

The adjusted index curve levelled out to 233, only one point below the previous recording.

Larger Scale Steel Buying By Automobile Plants Anticipated

Price Discussions Evaded; Some Consumers Still Getting Sheets at "Bargain" Figures

Orders for fill-in tonnages from automobile manufacturers are expected by steel company sales managers to give way in the next few weeks to buying on a larger scale. So far, however, there has been no indication of any deviation on the part of automobile manufacturers from their policy not to anticipate their steel requirements any more than called for by their assembly schedules.

The subject of price is not brought up by either buyers or sellers, but the competitive situation in the steel industry does not differ greatly from what it was before last year's clash over flat steel prices. That some consumers have been getting shipments of sheets at last year's bargain prices several months after they had been supposed to have come to an end, adds to the confusion.

Operations in the Detroit steel-making area are at around 70 per cent of capacity with a gradual stepping-up predicted. Sheet mills in the Pittsburgh district are running at between 50 and 60 per cent of capacity. Virtually the same conditions prevail in Cleveland and Youngstown. The rate of ingot output shows little change, the American Iron & Steel Institute's estimate for this week being 55.4 per cent compared with 55.7 per cent in the preceding week. Aside from eliminating for the time being one of the low-price sources of ferromanganese, the Czechoslovakian upheaval had little direct effect on the steel market. Warehouse prices on cold finished bars have been revised downward, the reduction amounting to 1/4 of a cent a pound.

News comes from Amsterdam that the Dutch delegation to this week's conference of the International Tin Committee at London will propose holding its June meeting in New York, so as to permit participants to establish closer contact with consumers in the United States, who absorb half of the world's tin production. New York importers are all the more pleased by this news as they have lately suffered considerably from the arbitrary actions of those who dominate the Singapore market. To what extent the tin market will be affected by purchases for the \$100,000,000 strategic raw material reserve under the May bill, which now bids fair to be enacted into law, is anyone's guess. It all depends upon how much tin is to be stored and how the purchases will be timed. The market this week marked time, awaiting news from the International Tin Committee meeting, spot Straits tin opening at 46.05 cents and advancing to 46.15 cents on Tuesday.

Chile appears to have changed her mind with reference to the tax on copper. Instead of taxing exports of the metal, as first planned, it is now proposed to tax the profits of the mine owners, most important among whom are American companies. Spot electrolytic in the outside market is quoted at 10.65 cents, with mine producers and custom smelters quoting 11 1/4 cents.—W. C. H.

Automotive Excise Taxes Up Sharply Over 1938

Excepting on trucks, sharp increases were made in February of the present year over February of last year in excise taxes on automotive products, oil and gasoline, as shown in the following Internal Revenue statement:

	1939	1938
Automobile trucks . . .	\$ 591,909.09	\$ 710,818.74
Automobiles and motor cycles . . .	5,965,328.84	3,863,048.32
Automobile parts and accessories . .	697,636.70	567,089.76
Tires	2,583,692.38	1,775,446.56
Inner tubes	525,932.59	375,206.42
Lubricating oils . . .	2,129,468.58	1,715,439.02
Gasoline	16,427,083.49	13,541,199.98

Polk Estimates 36% Gain in Registrations

New passenger car registrations in 24 states totaled 55,459 in February, according to R. L. Polk & Co., giving those states a gain of 36.07 per cent over registrations in the same month of 1938.

Last month's figure for those 24 states is 20.52 below the corresponding figure for January, however.

Polk compilations show a total of 11,522 new truck registrations in 25 states in February as compared to 9003 in February of last year, a gain of 27.98 per cent. January, 1939, registrations in the same states were 13,029.

NACA Tests Show Aero-Dynamic Drag of Rivets

Elimination of rivets in aircraft construction was advanced last week by Manley J. Hood, assistant aeronautical engineer for the National Advisory Committee for Aeronautics as an effective means of increasing aircraft speed, performance and economy.

In a paper presented to the aeronautic meeting of the Society of Automotive Engineers in Washington, Mr. Hood said that aircraft design and construction had reached the point where

it is necessary to consider the effects on aero-dynamic drag of rivets, sheet-metal joints, and other irregularities on the surface exposed to air flow. Wind tunnel tests conducted by his committee show that the most effective way to reduce rivet drag is to eliminate the rivets from the forward part of the wing, he said.

If irregularities are eliminated from this part of the wing, as is generally done in present construction, he explained, 180 hp. is still required merely to pull the remaining rivet heads and lapped joints through the air. The extra 180 hp. is equivalent to 270 lb. of extra engine and propeller weight or, on a 10-hr. flight, it also means about 860 extra lb. of fuel and tankage. Mr. Hood said that the total excess of 1130 lb. can be translated into additional pay load by eliminating the rest of the rivets and lapped joints and making the entire wing smooth and true.

He added that wings in order to have a minimum of drag must be smooth but need not be highly polished and that efforts to make all surfaces exposed to air flow smooth will pay good dividends.

Publications

The Holo-Krome Screw Corp., Hartford, Conn., has issued a catalog describing its "Fibro Forged Socket Screws".*

"Auto Radio Remote Controls" are described in a catalog published by the F. W. Stewart Mfg. Corp., Chicago.*

Bulletin No. 302 is a recent publication of The Imperial Brass Mfg. Co., Chicago. It describes the company's new "Sel-Bat-Test" battery tester.*

New bulletin issued by Worthington Pump and Machinery Corp., Harrison, N. J., describes the company's high-pressure, forged-steel-casing, centrifugal pumps.*

"The Clark Carloader Method" is the title of a brochure recently issued by Clark Tractor division of Clark Equipment Co., Battle Creek, Mich.*

Oakite Products, Inc., New York, has prepared a booklet describing and illustrating its recently developed solution-lifting steam guns designed for use in plants with 30 or more pounds available steam pressure to meet a wide range of cleaning purposes.*

A booklet on servicing equipment for automotive repair shops has been published by the South Bend Lathe Works, South Bend, Ind. All-purpose lathe equipment for different types of shops is described.*

Flexrock Co., Philadelphia, has issued a folder describing its product known as Longlife, a pure mineral asphalt for roofing, waterproofing, factory caulking, and other purposes.*

The George Scherr Co., New York, has just published a general catalog showing the complete line of machine tools, instruments and machinery handled by this organization.*

A pamphlet issued by Riess Equipment Co., Pottstown, Pa., describes the company's new brake drum grinder and lathe.*

A pictorial résumé of the complete line of latest type presses and shears manufactured

by the Niagara Machine & Tool Works, Buffalo, N. Y., is present in a pamphlet brought out by this company.*

A new 15-page pictorial showing the advantages of concrete roads for all types of highway users has been prepared by the Portland Cement Association, Chicago.*

Two new products of Wheelco Instruments Co., Chicago, are covered in recent literature. One, a dial-indicating thermometer, and the other a potentiometer controller, series 3200.*

The Cecostamp, product of the Chambersburg Engineering Co., is fully described in the company's bulletin No. 275A.*

Eyeshields manufactured by the Jackson Electrode Holder Co., Detroit, are described in a bulletin recently issued.*

"Fifteen Years Behind the Brush" is the title of a booklet on aluminum paint for wood priming published by the Aluminum Co. of America.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Walsh Will Head Hearings Committee on Contracts Act

The Senate Committee on Education and Labor has named Senator Walsh, Democrat of Massachusetts, as chairman of a sub-committee whose job will be to hold hearings on the Senator's bill to broaden the Walsh-Healey Public Contracts Act, under which the Labor Department lays down labor standards to be adhered to by firms doing Government business. No date has been fixed for opening the hearings.

The measure would revise the law to include under its provisions contracts of more than \$2,000, whereas the present limit is \$10,000. It would cover sub-contractors for the first time and would revise the penalty provision permitting employees to collect double the amount due them in case of a violation of the minimum wage standards.

In view of the recent defeat of the CIO in its attempt to prevent firms found violating the Wagner Act from securing Government business under the armament program, it is considered likely that labor organizations will push for passage an amendment to the Walsh-Healey Act designed to place persistent violators of the Wagner Act on a blacklist and denied Government business. The CIO sponsored a bill last session containing such a provision but it was defeated when the House Rules Committee refused to give the measure right of way to the House Floor.

Buick's March Sales Double 1938 Record

Domestic retail deliveries of 5588 Buick cars during the first 10 days of March were 2948 units or 111.6 per cent greater than the corresponding period a year ago and compared with 3917 deliveries in the first 10 days of last month, a gain of 1671 sales or 42.6 per cent.

Used car sales by Buick dealers during the first 10 days of March totaled 10,485 units.



Acme

For Fortifications and Foundations

This tamper, weighing 2500 kilograms (approximately 5500 lb.), requires only one man to operate it. It is shown being used for packing dirt for the fortifications and foundations of the Reich Auto Highway. The tamper was exhibited at the Leipzig Fair in Germany.

Steady Pace of Business Activity Continues; Fisher's Index at 79.9

*An Exclusive and Regular Weekly Feature
Written by the Guarantee Trust Co., N. Y.*

Apparent general steadiness of business activity at the beginning of last week was overshadowed by the grave disturbance in international affairs. The *Journal of Commerce* index of business for the week ended March 11 registered a slight advance to 86.8, as compared with 86.5 for the preceding week and 70.6 a year ago.

Mixed trends were evidenced last week in both retail and wholesale trade, with unfavorable weather conditions in some regions reflected in lessened sales volumes. Department store sales in the week ended March 11 were only 2 per cent above the comparable 1938 level, as against a similar margin of 7 per cent in the preceding week, according to the report of the Board of Governors of the Federal Reserve System.

Production of electricity by the power and light industry in the week ended March 11 declined less than seasonally, and the margin over corresponding output last year rose to 11.1 per cent, as against 10.2 per cent for the week before.

Railway freight loadings in the same week totaled 591,691 cars, 7000 fewer loadings than in the preceding week but 6.3 per cent more than in the like period last year.

The average daily production of crude oil in the week ended March 11 was 3,353,000 barrels, or 38,150 barrels more than the preceding weekly average. The average daily requirements this month, as computed by the U. S. Bureau of Mines, are 3,340,000 barrels. Engineering construction awards in the week ended March 16 total \$46,449,000,

as compared with \$36,575,000 in the preceding week and \$50,784,000 in the corresponding period last year, according to *Engineering News Record*.

Reported lumber production, shipments, and new orders declined in the week ended March 11. As compared with the figures for the like period last year, production showed a negligible decline, and shipments registered a gain of 5 per cent.

Cotton-mill activity again increased more than seasonally in the week ended March 11. The *New York Times* index rose to 120.9, as compared with 119.6 for the week before and 91.6 a year ago.

Domestic consumption of cotton in February amounted to 629,102 bales, as compared with 657,045 bales in the preceding month and 475,390 bales in the like month last year.

Professor Fisher's index of wholesale prices for the week ended March 18 stands at 79.9, as compared with 80.2 for the preceding week and 79.7 for the week ended Feb. 18.

Reserves of member banks of the Federal Reserve system increased \$92,295,000 in the week ended March 15. Estimated excess reserves increased \$30,000,000 to a total of \$3,440,000,000.

Ford Sales Pick Up

Combined sales of Ford and Mercury cars and Ford trucks for the first 10 days of March increased approximately 45 per cent over Ford sales of the same period a year ago.

Men and Machines

Machine Tool and Electrification

By H. E. BLANK, JR.

FOLLOWING close on the heels of the ASTE Machine and Tool Progress Exhibit in which blasted sky high all of its previous records for attendance and business done "on location" by exhibitors, the 1939 Machine Tool and Electrification Forum sponsored by the Westinghouse Electric & Mfg. Co. is scheduled to open April 18 at the company's plant in East Pittsburgh, Pa. Most of the papers on the Forum program will be presented by visiting representatives of the machine tool industry. William F. Ridgeway, of the Ingersoll Milling Machine Co., will outline the considerations determining sizes and characteristics of motors for machine tool service. Cost advantages and limitations of electric drives will be discussed by Robert S. Elberty, of the Landis Tool Co.

Other discussions tentatively scheduled for the three-day program will cover the possibilities of streamlining for production machines, applications of reversing motors, control devices, instruments, and electric handling of auxiliary machine functions. On April 20 the visitors and delegates will make a trip through the Westinghouse Research Laboratories. *Men and Machines* will report further details on the Forum in subsequent issues.

Before the "doings" at the ASTE convention are placed on the shelf so far as this column is concerned, we want to put on the record several pertinent ideas advanced by William B. Stout, president of Stout Engineering Laboratories, and featured speaker at the society's annual dinner. "We have now gotten to a point," said Mr. Stout, "where it is time to take inventory as to where tooling for production should stop in its vastness of expenditure and in its freezing of capital onto designs which cannot be changed."

"In our own automobile business," he continued, "a company will spend \$500,000 on fender dies and two or three million on welding equipment and jigs for producing a satisfactory design. As that design begins to get obsolete—as it will, through research, in only a few years—the investment in tools is so great that the firm making the production cannot afford to change and must spend more and more money in advertising and sales pressure to make the public take—for as

long a period as possible—that product which it is forced to make."

Management, in the opinion of Mr. Stout, must give attention in future design to balance between the progress of research, bringing new and better things with great rapidity, and the amount of tooling spent for production which may freeze the design beyond its commercial time period of sales. Future designs, he forecasted, will be laid out for less die and expensive tool cost, for simpler forms, more artistic, but less bulbous lines—so that "one may build in smaller production, a car at equal cost without having, even in large production, a tool cost of \$100 per car."

In addition to Mr. Stout's remarks we have a number of new product developments to report. One of the most interesting to pass across our desk in recent weeks is the hydraulic "Rivitor" developed for use in the fabrication of airplane fuselage and wing structure. The machine is designed to feed and

set countersunk-head rivets (or round head rivets if so desired) automatically. A few of many features are: automatic feeding of the rivets, visibility in locating the work on the rivet, pneumatic (fast) operation of the hydraulic valve to effect the power movement used to do the riveting, setting of rivets in curved sections as easily as in straight sections, and pressures up to 12,000 lb. available for riveting.

This machine, manufactured by the Tomkins-Johnson Co., Jackson, Mich., is capable of setting up to and including 3/16 in. diameter rivets 1 in. long. It handles up to 5/8 in. length differential without change in tooling.

National Broach & Machine Co. has designed a special head for use on its "Red Ring Gear Tester" which provides means for accurately checking the lead of helical gears against a master gear or a master disc. Master and work gear are mounted rigidly on the same axis. A fixed ball point contacts the master. A similar recording point con-



Ring Around a Ring Gear

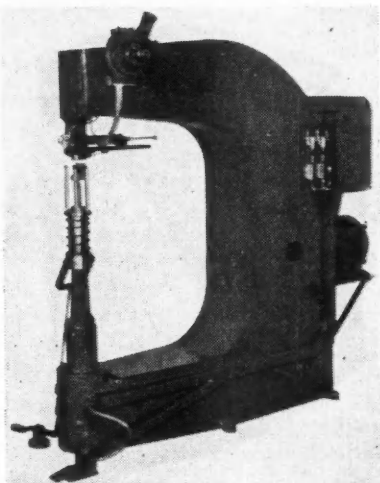
International Harvester executives, who are spending \$12,000,000 on plant modernization and expansion, looked over the machine and tool progress exhibition in Detroit for new ideas. Here they are discussing a new method of producing ring gears. Left to right: B. F. Bush, Colonial Broach Co., Hugo A. Weisbrodt, assistant superintendent International Harvester, Charles R. Staub, chief engineer, Michigan Tool Co., and C. M. Harrison, general superintendent of International.

Forum Set for April 18

**Many Representatives of the Machine Tool Industry
Will Present Papers During Three-Day Program
Sponsored by Westinghouse Electric & Mfg. Co.**

nects the tooth of the work gear. Sliding the head causes the grinding point to rotate the gears as it moves across the face of the master tooth. The recording point shows the lead error on an indicator.

An internal spline grinder manufactured by the "Saurer" company in



Tompkins-Johnson hydraulic "Rivitor" for use in aircraft construction.

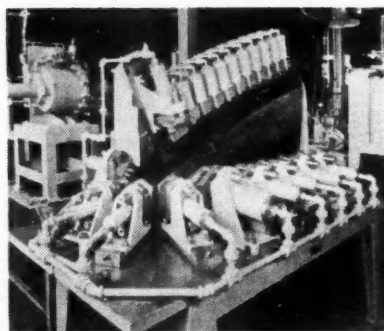
Switzerland is now being sold in this country by W. A. Schuyler, New York. The machine grinds with precision premachined internal splines. A small turbine rotor is mounted alongside the grinding wheel on the spindle shaft. Through the hollow shaft of the grinding apparatus, which carries the wheel and rotor, soda water is pumped at high pressure to the turbine.

The machine can grind from 4 to 24 splines of square or involute profile, and in bores from $\frac{3}{4}$ -in. to 4 $\frac{11}{16}$ -in. in diameter and up to 7 in. long. For square splines a cupped wheel is used, and for involute splines the wheel has the profile of the spline; in either case, the machine is provided with a wheel-dressing device.

The grinding apparatus is mounted

in a vertical slide which reciprocates in ways on the front of the column head. On the down-stroke of this slide the wheel grinds one flank of the spline, and before it starts the up-stroke it moves diametrically across the bore; when going up it grinds the flank lying in the same plane of the opposite plane. Feeding the wheel against the spline flank is done by a cross slide in the column head. The feed can be regulated very finely by a graduated feeding wheel which is either hand operated or driven from the table by a cam-operated push-rod. Then the indexing change-gears, which are in mesh with the large ring gear under the work table, turn the work automatically through one spline.

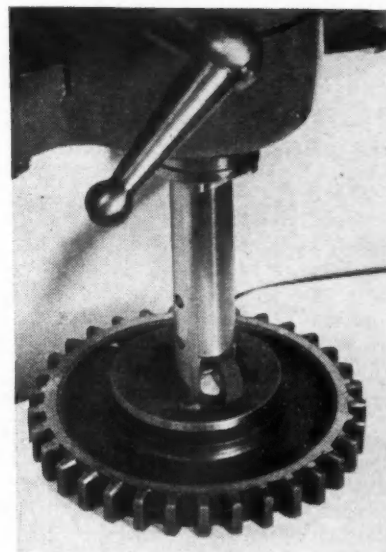
Two hand wheels, each provided with a graduated scale, set the feed and the diametrical stroke of the grinding wheel. A clamping screw moving in a graduated slot inside the column head determines the vertical stroke. The machine is engaged by a



Progressive Welder Co. equipment set up for punching 36 holes in one half of hood top

shift lever on the gear box and is driven by a $3\frac{1}{2}$ -hp. motor.

A new development in punching and stripping equipment utilizing the combination of hydraulic pressure with balanced spring action has been announced by the Progressive Welder



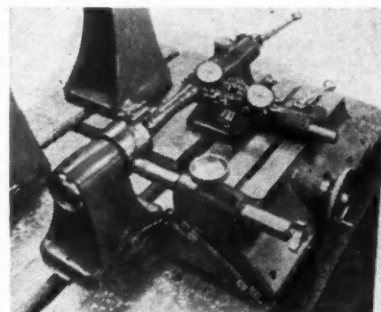
"Saurer" internal spline grinder.

Co. There are two types of units, one for single punch operation and another for a multiple of punches per unit.

The design of the multiple punch hydraulic unit permits the use of a single acting piston which, the manufacturer points out, eliminates troublesome packing glands, permits a greater bearing surface for the piston and rod, and requires half the amount of piping which would otherwise be necessary. Close adjustment of the entire unit in relation to the work is provided at the mounting bracket.

In the single punch unit, stripping is performed entirely through the action of balanced springs, the operation being completely automatic. Multiple punch units are available either for hydraulic or mechanical stripping.

An example of the use of hydraulic punching with mechanical stripping is shown in the accompanying photograph of an installation for an automobile plant consisting of 20 of the mechanical stripping units mounted in a fixture to punch a total of 36 holes in one half of a hood top. Four such fixtures are used for left and right-hand hood top halves for both six and eight-cylinder cars. Fixtures are push-button controlled. Each is operated by one man with an average production of 150 pieces per hour.



Special head for National Broach "Red Ring Gear Tester"

How to "Own" a Car Without Buying One

Carservice, Inc., New York, to Begin Rental Service for Professional People on April 1

Automobile ownership without capital investment in a car, is being offered doctors, salesmen and other professional people by Carservice, Inc., Long Island City, New York.

The customer picks any make of car. A contract is drawn up providing:

1. Complete service, including garaging, fueling and oiling and greasing; insurance on any basis wanted by the customer; constant preventive maintenance and daily washing; and delivery in the morning to the customer's home and calling for the car at night.

2. A new car is always available in case of an accident, guaranteeing continuous, uninterrupted service.

3. The whole plan is worked out in advance, and the customer pays for his *de luxe* service by the week or month.

In essence, the Carservice plan is similar to the rental services for trucks, and was born of 20 years' experience as a car and truck salesman in the mind of J. A. Herwitz.

Three garages will inaugurate the service on April 1. The response to preliminary merchandising of the idea has been gratifying. Selected lists of physicians and salesmen were made up, and these prospects were written about the plan. Ten per cent of about 800 physicians wanted to know more about the plan, and most of these have signed up for the service. Several of the deals involve buying the prospect's present car, and crediting his account with the agreed price.

Short newspaper items have stirred up considerable interest as far north as Boston and throughout Connecticut and northern New Jersey. Four salesmen are kept busy explaining the details of the plan to inquirers.

Sales have been made on the points of no investment, no worry, and no responsibility.

There can be no fixed price for the service, because each prospective customer has specific requirements. The price depends upon the car itself, and whatever additional services are wanted. But on a weekly or monthly payment schedule, the cost of driving a brand new car always kept in the best mechanical condition, always starting the day with a full tank of gasoline and always properly greased and oiled, is attractive.

The office of Carservice is in the Surrey Motors Corp. Officers of this Buick dealership are connected with the project, and the ability of the service to buy new models at less than delivered prices and to garage and maintain the fleet at this establishment and its two branch garages, stands the service in good stead.

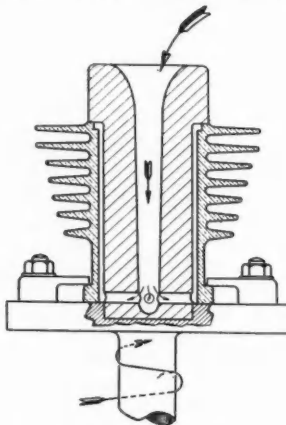
Although Surrey Motors is a Buick dealership, any make or model of automobile can be contracted for. Thus far, Buicks and Chevrolets have been chosen by customers.

Initial interest in the plan has induced Mr. Herwitz to look for accessible garage facilities in Manhattan and other boroughs of New York, from where inquiries have already been received.

The service costs no more, Mr. Herwitz estimates, than the whole cost of buying a car, garaging it, and keeping it in good condition as far as the customer is concerned.

Abstracts

A new method of providing an engine cylinder of light alloy with a liner of hard metal by casting it in has been patented by the German firm of Fichtel & Sachs, manufacturers of a very popular engine of small displacement. The hard metal is poured into an annular



space formed between the interior of the cylinder proper and a core set into it, through a central hole through the core. While the metal is being poured the cylinder is being revolved around its axis at high speed, in order to produce a centrifugal effect, and the resulting high pressure of the molten metal against the wall of the cylinder is said to cause it to alloy with the light alloy at the junction surface, thus providing a bond that ensures excellent heat flow to the cooling fins.—*Revue de L'Aluminium*, December.

Ford Asks NLRB to Dismiss Charges

In oral arguments before the three members of the National Labor Relations Board, Frederick H. Wood, of New

York, counsel for the Ford Motor Co., on Tuesday asked the Board to reverse a trial examiner's ruling which had charged that the company discriminated against 130 employees at its Richmond, Calif., assembly.

The examiner's report, written by Thomas H. Kennedy, who alleged that the company had refused to bargain with the UAW in violation of the Wagner Act, had recommended that 1900 workers be reinstated with back pay dating from January, 1938. Mr. Wood told the Board that Kennedy's findings were not supported by substantial evidence, that the examiner had incorrectly applied the seniority rules and that he had failed to show that the company breached an agreement with its employees. He urged that the discrimination charges be dismissed on these grounds.

The Ford attorney also cited the Supreme Court decision in the *Fansteel* sitdown case as a reason why the company should not be required to reinstate the 130 employees at the California assembly plant.

New ASTE Show Slated for '41

**Weaver of Westinghouse
New President of Society**

The machine tool and progress exposition of the American Society of Tool Engineers which closed last week will be placed on a biennial basis, hereafter, according to an announcement by Walter F. Wagner, retiring president. In accordance with this decision by the board of directors, the next show will be held in 1941.

James R. Weaver, director, equipment, inspection, purchases and tests, Westinghouse Electric & Mfg. Co., was elected president of the ASTE. His cabinet will be as follows:

A. H. d'Arcambal, consulting metallurgist, Pratt and Whitney Co., first vice-president.

E. W. Dickett, proposal engineer, Sundstrand Machine Co., second vice-president.

Floyd W. Eaton, Burroughs Adding Machine Co., secretary.

Frank R. Crone, chief tool designer, Lincoln Motor Car Co., treasurer

Ford R. Lamb, re-elected executive secretary.

The final technical session featured a symposium on new developments, drawing upon the experience of four typical organizations. K. R. Herman, vice-president, Vickers Inc., dealt with the widening applications of hydraulic mechanisms, described the current design features of Vickers motors and variable pressure pumps. The speaker high-spotted the applications of such units by showing slides of various types of machine tools, road machinery, industrial equipment, fitted with hydraulic mechanisms.

C. Johnson, Pratt & Whitney Co., presented an interesting discussion of the advancement made in the design and uses of production gages. He defined a gage as "an instrument which facilitates production, controls quality." He intimated that the future will see automatic gaging, entirely free of the human element.

L. C. Gorham, Gorham Tool Co., described in detail the variety of tool steels available today, pointing out the need for careful selection on the part of the tool designer. In this complexity he noted carbon tool steels, high-speed-steels including tungsten and molybdenum alloys, various Haynes-Stellite alloys, and the variety of cemented-carbide combinations.

R. S. Drummond, president, National Broach & Machine Co., wound up the proceedings with a talk on the latest developments in gear tooth finishing. According to the speaker, an outstanding feature is the technique of certain modifications in tooth profile and form, such as the rounding of involute profile at the pitch line, most novel being the "crowning" of the face of the tooth at each end so that the chordal thickness at the center is slightly greater than at the ends. In "quiet" transmissions, this avoids the objectionable edge contact between gear teeth occasioned by errors in gear cutting or misalignment at assembly.

At the first technical session the subject of new developments in diamond boring and turning was covered in a brief but comprehensive paper by F. T. Ellis, representative of the Heald Machine Co.

Books

TABLES D'ENGRENAGES A DEVELOPPANTES (INVOLUTE GEAR TABLES), by Y. de Molon. Published by Dunod, 92 rue Bonaparte, Paris.

This book, which is intended for the practical men in the gear industry whose mathematical knowledge may be limited, contains charts for determining gear dimensions, bending stresses in gear teeth at the root, interference, necessary profile corrections, duration of tooth contact in circular pitches, the efficiency of gears and the maximum tooth-contact pressure. In the general treatment, which forms the first part of the book, only an elementary mathematical knowledge is expected of the reader. The classical treatment of the problem of sliding motion was purposely omitted, as its understanding calls for more than an elementary knowledge of theoretical kinematics.

Calculations are largely rendered unnecessary, by the use of carefully drawn charts, which form the principal original feature of the book. Tooth profiles and formulas form the second part. The unfortunate part from the



Acme

Scooters for Postmen

Henry R. Smith, Columbia, S. C., letter carrier invented this motorized scooter which is said to have cut from one to two hours off the time required for an eight-mile route. The vehicle is a four-wheel conveyance, about four feet long and powered with a $\frac{5}{8}$ hp. internal combustion engine.

The driver stands at the rear and with one hand steers the machine, and with the other operates a control that throws the engine out of gear and applies the brakes at the same time. Speeds range from 4 to 12 m.p.h. It is claimed that cost of the conveyance would be between \$50 and \$75 if it were manufactured on a mass production basis.

American standpoint is that all charts and formulas are based on the "module" rather than on the pitch system. In countries where the metric system prevails and where gear teeth are dimensioned in accordance with the "module" system these charts should prove helpful.

Ford Wants Assessments of Buffalo Properties Halved

Assessed valuation of the Buffalo, N. Y., properties of the Ford Motor Co. and Henry Ford & Son, Inc., will be cut almost in half if the companies are successful in their forthcoming Supreme Court proceedings to reduce their \$2,393,960 assessment for 1939.

The companies claim they have been overassessed \$1,021,312 this year on their four pieces of Buffalo property. They want to have their assessment reduced by that amount, bringing the figure down to \$1,372,648.

Writs of certiorari have been granted the companies. If the courts accept the companies' figures it would mean a loss to the city of almost \$30,000 in the real

estate tax. Instead of paying about \$69,448 in taxes the companies would pay only about \$39,820.

Properties covered in the writs are the assembly plant and adjoining land in Fuhrmann Blvd., the old assembly plant at Main St. and Rodney Ave., and a piece of unimproved property in Fuhrmann Blvd. owned by Henry Ford & Son, Inc.

The companies allege that the assessments are in violation of the United States and state constitutions, that the assessors have set the amounts too high.

Murray Corp. Reports Loss on '38 Operations

Statement of the Murray Corp. of America, Detroit, for the year ended December 31, 1938, reports a net loss of \$1,495,699 after provision for depreciation of \$763,474 and after deduction of reserves, and all other expenses.

Men

E. W. Seeger has been appointed chief engineer of Cutler-Hammer, Inc., Milwaukee, manufacturers of a wide variety of electrical controls. Since his graduation from Ohio State University in 1913 he has been in the shop and engineering departments, being appointed assistant chief engineer in 1928. Mr. Seeger has had a prolific inventive career and is widely known as an author of technical papers and textbooks.

Roy C. Muir, vice-president in charge of engineering, General Electric Co., Schenectady, N. Y., has been elected by the board of regents of the University of Wisconsin, Madison, to receive the honorary degree of doctor of engineering at the 1939 commencement exercises in June. He is a native of Wisconsin and a graduate of the university. The honorary degree is to be awarded for his work as chairman of the education committee, General Electric.

Herman Van Tongeren, prominent consulting engineer of Heemstede, Holland, will give an illustrated lecture on "Dust and Dust Collection" at the monthly meeting of the Milwaukee section, American Society of Mechanical Engineers on March 29. He is head of the Bureau Voor Toegepast Aerdynamica at Heemstede, and member of leading European engineering societies.

S. C. Black and his son, Claude Black resigned as works manager and factory manager of Los Angeles plant, respectively, of Willys-Overland Motors, Inc. They announced plans for a vacation in Florida and that they would enter business together. The elder was manager at Los Angeles for several years until drafted to Toledo by David R. Wilson, former president, to take full charge of operations.

Chicago's Navy Pier Again Selected for the ASI Show

S. G. Levy Named Chairman of Joint Operating Committee; A. B. Coffman to Be Show Manager

The 1939 Automotive Service Industries Show will be held on Navy Pier, Chicago, Dec. 11 to 16, according to the decision of the joint operating committee which met in Chicago on March 20. The committee includes four representatives from each of the three sponsoring associations—National Standard Parts Association, Motor and Equipment Wholesalers Association and Motor and Equipment Manufacturers Association.

S. G. Levy, W. Bergman Co., Buffalo, was named chairman of the committee and G. N. Lockridge, Kansas City Automobile Supply Co., Kansas City, Mo., vice-chairman. A. B. Coffman, Chicago, will again act as show manager, and Herbert Buckman, Cleveland, will continue as secretary of the operating and credentials committees.

Time and place for the show, particularly the decision as to whether the show should continue to be held in December, were important features of the committee meeting. It was announced that election of the time and location was arrived at only after extended research and survey work by the sponsoring associations and the committee. Availability of adequate exhibit and hotel facilities as well as factors in the wholesale trade were considered in connection with a referendum vote on the subject taken among members of the sponsoring associations.

The committee's decision marks the fourth successive year in which the ASI show will have been held on Navy Pier at approximately the same dates although the 1939 show will come one week later than last year.

spent at Washington. On May 15 the French party will visit the Goodyear plant at Akron, traveling the same day by car to Cleveland, where the Cleveland Graphite Bronze Company's works will be visited, also the Winton factory. Moving to Toledo the same day, visits will be made to Willys, Auto-Lite and Tillotson works.

May 17 will be spent at the Ford factory, in Detroit. The following day Chrysler, Packard, Timken, Gemmer and Gar Wood factories are on the program. On May 19, the party will spend the morning on General Motors proving ground and the afternoon in the General Motors works, traveling that night to Buffalo.

Reaching New York on May 21, the French engineers will attend the first three sessions of the S.A.E. gathering, and will sail for home May 25 on the "Champlain."

It is understood that some of the French engineers will present papers on European light cars and on road construction.

New Engine for Aircraft Use Shown in Los Angeles

A new engine, designed primarily for airplane use but which can be used generally in the commercial field, claimed as revolutionary in type, was demonstrated in Los Angeles this week by Lieutenant S. W. Neighbors before a group of airplane executives and manufacturers. The new engine contains only 30 moving parts, is full rotary in principle and measures 26 inches in diameter by 18 inches overall in length; runs on five ball bearings and eliminates entirely the use of pistons, connecting rods and cylinders.

The engineers claim the engine weighs only 412 lb., develops 500 hp. at 4500 r.p.m., consumes eight gallons of fuel an hour and has attained in tests a speed of 10,000 r.p.m. without vibration.

According to Lieutenant Neighbors, the group which developed the engine is financed privately. A plane unit is under construction which will test out the engine in the air.

Public Ownership for the Aircraft Accessories Corp.

Another aircraft accessory manufacturing firm made its bow to public ownership this week. It is Aircraft Accessories Corp. of Glendale, Cal. Formerly privately owned, its capital has been expanded with the former owners receiving 40,000 shares of class B stock and 460,000 shares of class A for sale to the public.

The company's principal business is the manufacture of hydraulic equipment used in aircraft, such as pumps for landing gear and flap actuation,

automatic pressure regulators, check and relief valves, pressure accumulators and gun turret and bomb actuating equipment.

French Delegation to Attend SAE Congress

Members of the French Society of Automobile Engineers will attend the S.A.E. meeting at New York, May 22 to June 8. Arrangements are for the party to sail on the "Ile de France" May 4, reaching New York on the tenth. The first visit will be to Philadelphia, traveling on the Budd-built "Cavalier." The factories to be visited in and around Philadelphia are Vacuum Oil Company, Budd Works and Auto-car factory. May 13 and 14 will be

Chrysler Shows Scale Models at Exposition

Model automobiles, each costing more to construct than the full sized car it represents, are included in the "Chrysler Serves the World" exhibit at the Golden Gate Exposition.

Scaled accurately to one-sixth actual size, the models were designed by Chrysler Corp. engineers and executed by men regularly employed in the production of life sized automobiles.

There are 11 miniature cars and one model of a 56 ft. yacht powered by a Chrysler marine engine. Each took approximately six or seven months to build. The high cost of construction came in the necessity for hand made dies to stamp the small and exact parts for each type presented. After assembly, the models complete save for an engine, were given a spray paint job.

New Truck Registrations

	January 1939	December 1938	January 1938	Per Cent Change, January 1939 Over 1938	Per Cent of Total January	
					1939	1938
Chevrolet	13,615	12,125	10,338	+ 32.8	36.10	32.31
Ford	10,188	8,509	9,304	+ 9.4	27.01	29.08
International	4,709	3,932	4,581	+ 3.0	12.49	14.32
Dodge	4,002	2,598	3,145	+ 27.1	10.61	9.83
G. M. C.	2,384	1,769	1,777	+ 34.0	6.32	5.55
Plymouth	507	306	691	- 26.6	1.34	2.16
Mack	482	423	257	+ 87.6	1.28	.80
Diamond T	378	287	357	+ 6.0	1.00	1.12
White	333	288	270	+ 23.2	.88	.84
Studebaker	169	164	161	+ 5.0	.45	.50
Reo	168	197	217	- 22.5	.45	.68
Autocar	143	106	130	+ 10.0	.38	.41
Brockway	127	102	64	+ 98.4	.34	.20
Willys-Overland	88	118	179	- 50.8	.23	.56
Federal	85	98	118	- 28.0	.23	.37
Divco	75	78	47	+ 59.6	.20	.15
Hudson	47	28	103	- 54.4	.12	.32
Stewart	47	32	27	+ 74.0	.12	.08
Bantam	33				.09	
Sterling	25	32	16	+ 56.2	.07	.05
F. W. D.	23	17	66	- 65.2	.06	.21
Indiana	15	21	31	- 51.6	.04	.10
Miscellaneous	72	244	116	- 38.0	.19	.36
Total	37,715	31,474	31,995	+ 17.9	100.00	100.00

Just Among Ourselves

Custom-Made Transportation

WE took pains to point out, nearly a year ago (see *A.I.* for April 9, 1938, p. 510 *et seq.*) some of the details of British plans for renting automobiles to the ultimate individual user. To remove any lingering impression that the argument was being manufactured to fill space, we explained in connection with the article, "Persistent rumors say that an American automobile manufacturer will introduce a plan for renting passenger automobiles to the public, instead of selling them. How much lies behind the rumor it is impossible to ascertain.

"Is the idea crazy? Not utterly.

"Scores of automobile dealers in the U. S. rent hundreds of automobiles and trucks on contract to business establishments and individuals. Some of them have been doing it for ten years or more."

All of which is still true, although there has been no added evidence of factory interest in the subject. Now, from New York, comes a story which seems to us to contain intimations of the inevitable. A service organization has been set up which supplies cars, without capital investment, to professional men and salesmen, at a rental figure based on individual requirements. When you read the whole story about it in the news section of this issue, we think you will agree that here is custom-made transportation, as contrasted with the older ideal of the custom-built car. Such an idea has in it, inherently, the elements of expansion. Whether it could succeed on a broader basis, is, as we see it, purely a question of price. The present effort seems aimed at a special market, to people who have the greatest need for uninterrupted, individual transportation, with a minimum of trouble connected with it. But that is also what most other people want, or think they want, and if the price can be made attractive enough, they will take a lot of it. The most important figure in any rental set-up is going to be the accountant. It will be apparent after a while how much service the public will pay for, which leaves the problem of the least amount for which it can be sold on a rental contract.

Something New

In Advertising

THIS morning's mail from Germany contained, in addition to our article on the Berlin truck show, a new brochure on the People's Car (Volkswagen, *vetturapopolare*, *voiture populaire*, as it is called in countries which have been flirting with similar ideas).

As a method of revealing to the potential purchaser the arrangement of the car and its design, this particular brochure is unsurpassed by any advertising effort we have seen. The pages inside the cover are of a transparent material ("Miss Hobson, what's cellophane in German?") with pictures of the car imprinted. As you turn successive pages you see passengers and luggage assume their proper places in the interior and the engine and chassis unfold in striking perspective. It's a difficult thing to describe in words. We suggest that if you have any German connections you ask them to get you a copy of the brochure. If you haven't, and you send your requests to us, they will be forwarded to our correspondent in Berlin, but we don't guarantee the results.

and The Truth is . . .

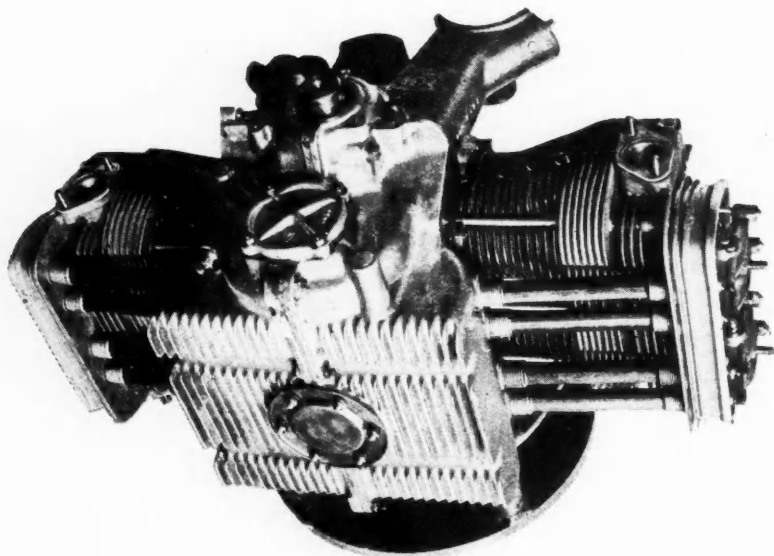
ANY week's reading of material which comes over the desk is not without its whimsical contrasts. "The United Automobile Worker," organ of the CIO-UAW remnant, ran an article in its issue of March 11 which was headed over three columns, "Fewer People Buying Fords." After about ten inches of type matter which pointed out that Ford sales were practically decimated by the American public's disapproval of Mr. Ford's labor policies, the article summarizes, "And so Ford cars find less favor with the American public week by week."

In a publicity release received by us on March 20, from the Ford Motor Company's advertising agency, the following facts are brought to light:

"Dearborn, Mich., March 16.—Combined sales of Ford and Mercury cars and Ford Trucks for the first 10 days of March were up approximately 45 per cent over Ford sales of the same period a year ago, it was announced at the offices of the Ford Motor Company here today. The pick-up in sales was especially noticeable during the past week, particularly in Eastern districts.

"A very encouraging sign for a big spring business was the sale of more used cars and trucks during the past 10 days than for any similar period since the National Used Car Exchange Week a year ago."

—HERBERT HOSKING.



Engine of the Volkswagen
seen from below

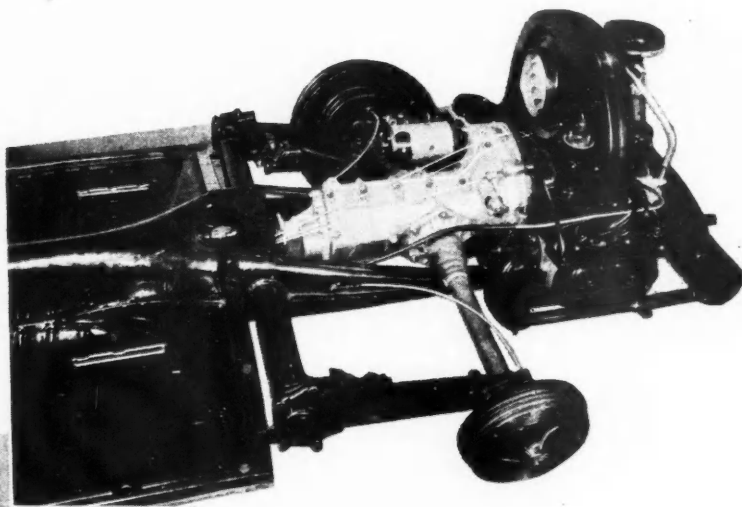
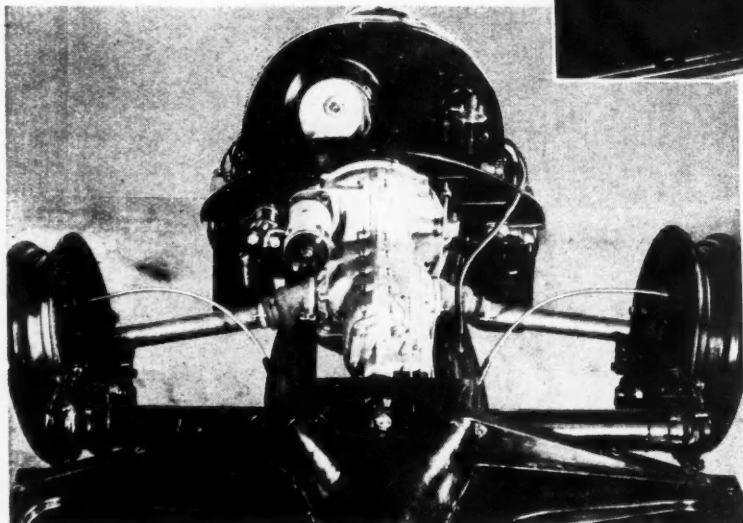
By EDWIN P. A. HEINZE
CONTROL over the automobile industry in Germany has been taken over by the Government. The new Volkswagen (or car for the masses) will appear on the market in less than a year, and it was felt that the established German automobile industry, in order to safeguard itself, would have to completely revise its production programs, reducing the number of models to keep down production costs. The Government so advised the industry, but the manufacturers were unable to agree among themselves, so Colonel von Schell was placed in charge and given dicta-

torial powers over production plans. The results are already becoming evident, and at the present Berlin show there are only 33 different German passenger-car chassis models on exhibition, as compared with 41 in 1938.

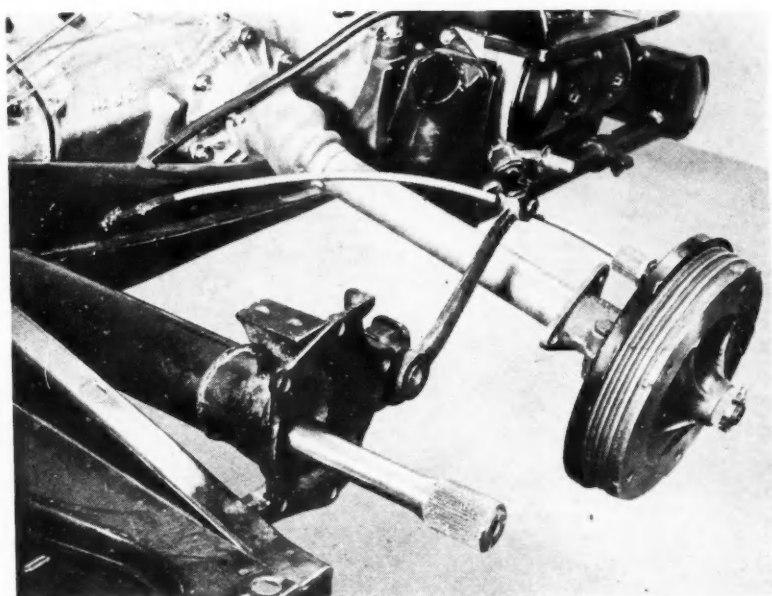
Although many of them will be

asked to make substantial sacrifices, German automobile manufacturers generally approve the step taken by the Government, for they realize that without Government intervention they would have been worse off. Colonel von Schell, moreover, has succeeded in carrying out his unpleasant task with as little friction as possible and is actually being regarded as a friend. He has been devoting his attention chiefly to the medium-price field, because manufacturers in the low-priced field fully realize that with the appearance of the Volkswagen they will have to set their house in order if they want to survive. In fact, manufacturers of low-priced cars already have begun to invade the medium-priced field, and the most urgent task therefore

(Below) Rear end of chassis, viewed from in front. (Right) Rear end of chassis, viewed from the left side



Berlin



Showing torsion spring extending from tubular cross member of frame; also shock absorber mounted on end of cross member

is to prevent overcrowding and disorder in this section of the industry.

Undoubtedly some of the present manufacturers of passenger cars will have to give up that activity in the future. Some of them produce passenger cars only as a side line, their chief products being aircraft engines, trucks, locomotives, industrial and stationary engines, and even a variety of mechanical products. Most of them are well supplied with orders, and their operations would not be seriously affected if they were to give up passenger-car manufacture entirely.

This little diversion into the field of political economy seemed necessary in order to sketch the background for the events now going on in the automotive industry in Germany. It also will serve to explain why there are practically no new models at this year's Berlin show.

The show is being staged in ten communicating halls and comprises not only exhibits of all types of motor vehicles, but also large propaganda sections displaying the work of the National Socialist Motor Corps, the German Automobile Club, the Army, the Post Office (which, by the way, is the largest operator of motor vehicles in the world and encourages its drivers to take part in sporting events of the reliability and cross-country type), and the research work of the technical colleges, which is controlled by a Government-appointed committee under the supervision of the Minister of Transport. In the large Hall of Honor are displayed the successful German racing cars and racing motorcycles, and in another most impressive hall at the entrance of the passenger car hall a large rotating map of Germany shows, by means of lighting

effects, the development of motorization during the past five years. In this hall are to be seen also two specimens of the new people's car, a chassis of which is shown in the other Hall of Honor, while in front of the halls a large number of these cars are available for trial runs. These cars, naturally, are one of the centers of interest of the show.

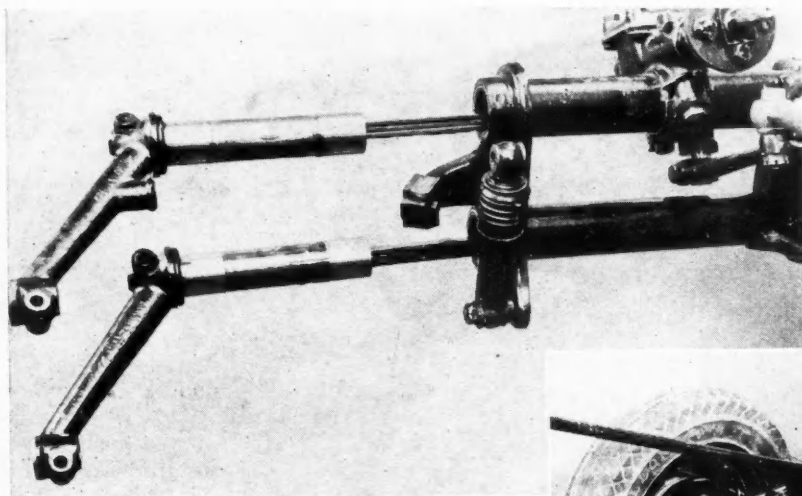
The people's car is built up on a central tube forked at the rear end, where the unit powerplant is located. The upper section of the tube is in one with the floor of the body, the tube being closed by a strip welded on from below.

The engine is a four-cylinder, opposed, air-cooled type, of 2.75 in. bore and 2.52 in. stroke (60 cu. in.). With a compression ratio of 5.6 it develops 23.5 hp. at 3000 r.p.m. Owing to the relatively low speed and the provision of an oil cooler, the car can be driven steadily at its maximum speed of 62.5 m.p.h.

Each cylinder with its cooling fins is a separate casting, but the two adjacent cylinders have a common cylinder head of aluminum in which the valves are located. The valves are actuated from a camshaft located centrally below the crankcase, by enclosed mechanism. The projecting rear end of the camshaft carries a belt pulley from which the 90-watt Bosch generator is driven, which is

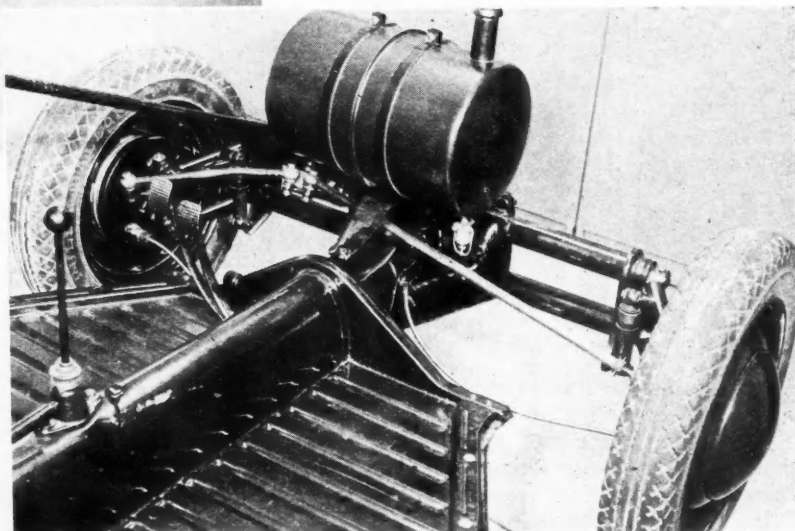
Motor Show

Reflects government control with practically no new models. New Volkswagen displayed and available for trial runs



(Left) Torsion bar front suspension of the Volkswagen by means of two sets of triple leaf springs

(Below) Front view of chassis, showing fuel tank and steering linkage



supported high up above the engine on a bracket cast integral with the right half of the light-alloy crankcase. A 6-volt electrical system is used, battery output being governed by voltage control. The 75-amp-hr. battery is mounted on a platform in front of the engine.

Mounted on the forward end of the generator shaft is the impeller of the blower. A detachable sheet-metal housing encloses the blower and the turret-like oil cooler. Air from the blower passes through sheet-metal casings surrounding the cylinders and is discharged downwardly. To the forward side of the blower casing is fastened the ignition coil. A downdraft carburetor is fitted and is supplied with fuel from the tank at the front of the car by a diaphragm pump.

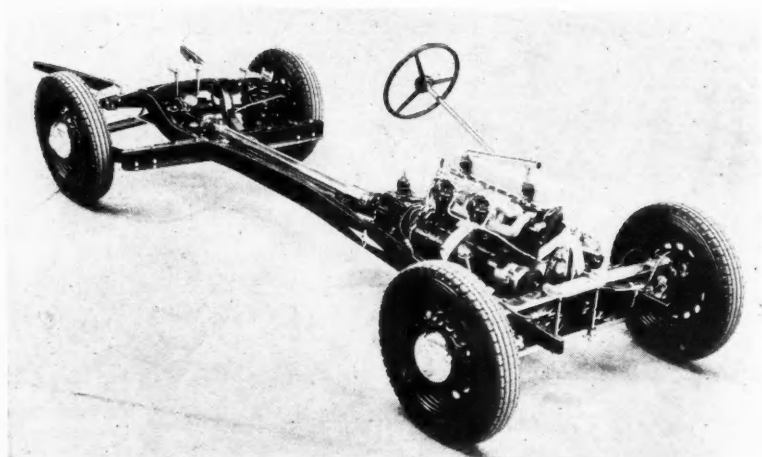
The power is transmitted through a single-plate clutch whose shaft extends through the differential housing to the four-speed transmission located in front of this housing.

From the differential it is transmitted to the wheels by jointed shafts. All gears in the transmission remain in mesh constantly, and the gears for the two higher speeds have helical teeth. The final drive ratio is 4.43. It is intended that the top gear, which is a direct drive, shall be used for fast driving in the country, while the third gear, which gives better acceleration, is to be used for city driving.

Each rear wheel moves around two pivot points, one being the center

of the joint in the differential housing, the other the axis of the torsion bar, which is inclosed in a tubular cross member in front of the engine and connected to the brake backing plate by a slightly flexible steel plate that takes the torque reaction and the driving thrust. There is a constant change of track as the wheels move up and down, the mean track being 49.2 in. This change in track has a damping effect on the springs, but additional damping is provided by hydraulic shock absorbers.

Each front wheel is suspended on two cranks whose main journals enter the outer ends of two transverse tubes secured to the forward end of the central tube. Each of the cross tubes contains triple-leaf springs worked in torsion, the springs being anchored in the tube at its center and fitting into sockets in the journals of the cranks. Front wheels therefore have a parallel up-and-down motion and there is no change in the front tread, which is 50.8 in. Damping of the front springs is by



The Borgward chassis with narrow frame and independent springing all around

small direct-acting hydraulic shock absorbers pivoted, respectively, to the top crank and a bracket on the lower transverse tube.

Brakes are mechanically operated and all four are applied by both the pedal and the brake lever, which latter is located centrally in the front compartment.

The fuel tank has a capacity of 6.63 U. S. gallons, and is provided with a three-way cock by means of which a 1-gal. reserve supply can be made available. At a speed of 56 m.p.h. the car does 33.5 miles to the U. S. gallon. Tires are of 4.50/16-in. size. The curb weight of the sedan is 1430 lb., while with a full complement of passengers and luggage the weight is 2200 lb. With a full load the minimum ground clearance is 8.6 in.

Owing to the rear location of the powerplant, the inside of the car is likely to be rather cool in cold weather, and provision is made for heating it by means of the engine-cooling air, which can be led into the body through the central tube.

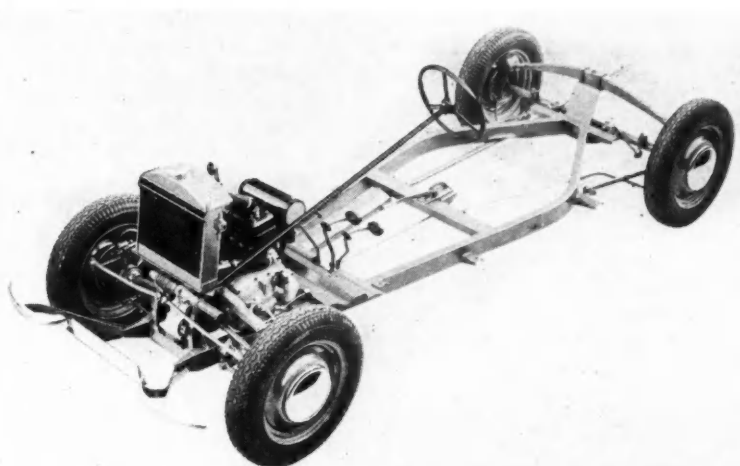


How the engine is made accessible in the Tatra rear-engined car

The above are the principal mechanical features of the Volkswagen, which has excellent performance characteristics, attaining a speed of 37 m.p.h. from a standstill in 14 seconds and being able to ascend a grade of 32 per cent with a full load in low gear. The wheelbase is 94.5 in., and the overall width and height of the well-streamlined car are 61 in. each.

which looked somewhat like the Volkswagen and was equipped with a four-cylinder L-head engine; and the big eight-cylinder model with 306 cu. in. engine. The former was not very popular with the buying public, for one reason because its repairs were said to be expensive, while the latter was rather obsolete, still having rigid axles.

A number of improvements have



Chassis of D.K.W. car with two-stroke engine and front drive, which has a new frame

So far the lines of Mercedes-Benz firm and of the Auto-Union have been little affected by the new regime. The former has dropped two models, viz., the rear-engined model,

been made in the 170 V, the conventional model carrying the same engine as the discontinued rear-engined car. A by-pass type thermostatic valve is now fitted in the cooling system, as is also a combined air cleaner and inlet silencer. A new type of air cleaner now coming into general use in Germany first passes the air through an oil bath and then subjects it to a whirling motion to separate out the entrained oil. The gasoline-tank capacity of the Mercedes-Benz 170 V has been increased from 8.7 to 11.3 U. S. gallons.

In place of the former Model 230 the company now offers a new model having the same engine (a six-cylinder of 140 cu. in. displacement) but a chassis similar to that of Model 170 V with tubular side rails of oval section, the tubes being drawn together at the center and forming a sort of elongated X in the plan view. Automatic heat control is a feature of this new model. Front suspension is on double transverse springs; the rear suspension has remained the same, except that only a single coil spring is used on each side, the same as in the smaller 170 V. The hand brake lever is now of the pistol-grip type and is mounted centrally under the instrument board. An engine heat indicator is now fitted, and the fuel tank has been enlarged. Side panels of the engine hood now remain in position when the lid is lifted, but they, too, can be removed after loosening two screws. There are two steel boxes in the rear part of the engine compartment between the engine and dash, which are uncovered when the lid of the hood is removed. One holds the battery, while the other serves as tool box.

This car is equipped with a ven-

tilator in front of the windshield which can be opened more or less from inside the car. The air entering this ventilator is strained and then admitted to a box, which it leaves through slots in the top of the instrument board, and then rises in back of the windshield. The arrangement is such that air heated by a Bosch car heater can be admitted to this box. New bodies have been designed for this model, with newly designed interior hardware. Provision for a car radio is made on the instrument board, and all cabriolets are furnished with a built-in aerial, while sedans and sunshine-roof sedans can be had with a telescopic aerial that can be extended from within.

The displacement of the "320" has

els are now equipped with a new five-speed transmission in which all except the first speed are synchronized, the fifth speed being an overdrive giving the car a top speed of 90 m.p.h. without use of the supercharger, the corresponding engine speed being only 2700 r.p.m. This same transmission is now used also on the Big Mercedes brought out last year. On the Diesel-engined Mercedes a 24-volt starting system is now used, the car being equipped with two 12-volt batteries that are connected in series for starting.

Coming now to the products of the Auto Union (D.K.W., Wanderer, Audi, and Horch), the first mentioned has been redesigned to a certain extent, probably with a view to fitting a more powerful engine when

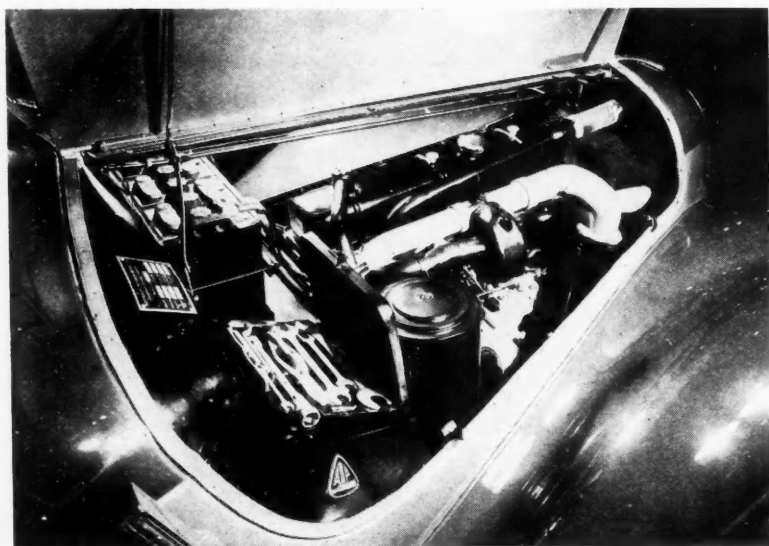
include duplex mechanical brakes, two-point mounting of the power-plant on rubber, and clutch operation through a cable which is not affected by movement of the engine relative to the frame and body by reason of the rubber mounting. The four-cylinder 61-cu. in. D.K.W. is continued unchanged.

The front-drive Audi has been discontinued and replaced by a car having a six-cylinder engine of 195 cu. in. displacement (82 hp. at 3600 r.p.m.) with overhead camshaft. The chassis is identical with that of the 165 cu. in. Wanderer with L-head engine. It is equipped with a Solex two-stage carburetor [evidently similar in principle to the Ball & Ball used on Chryslers years ago—Editor], and with a wholly synchronized four-speed transmission. It has a maximum speed of 81 m.p.h. and a cruising speed of 73.5 m.p.h.

The Wanderer model with 122-cu. in. valve-in-head engine has been abandoned, while the other two Wanderers, a four and a six of the same bore and stroke, are continued practically unchanged. Horch cars also remain unchanged, although the rating of the V-8 engine of the smaller one, an L-head engine of 232 cu. in. displacement, has been increased from 82 to 92 hp. at 3600 r.p.m. One of the exhibits of greatest attraction at the show was a fully-streamlined Horch with a pillarless four-door sedan body and said to have a speed of 100 m.p.h. A feature of this car was a wash basin concealed under the engine hood, with hot and cold water on tap. By pulling on a knob on the inside of the car a flap in the hood with the basin attached opens. When closed, the fitting is invisible.

The Bayerische Motorenwerke continue their 122-cu. in. model and have added a larger car with six-cylinder valve-in-head, 213-cu. in. engine of 90 hp. rating. The design follows the same lines as that of other B.M.W. models. An oil cooler together with an oil thermometer and a cut-out which functions when there is danger of the oil getting too cold, is offered as extra equipment. The car has a fully synchronized four-speed transmission. Lightness is the keynote of the design, the same as in the case of other B.M.W. models, and the four-passenger sedan weighs only 2860 lb. Rear suspension is on torsion bars extending lengthwise of the car and connecting to the rigid rear axle through levers. Driving thrust and torque reaction are taken on central triangular radius rods.

Adler now lists the 122-cu. in. (Turn to page 408, please)



Carrying the battery and tool box on front of dash in the B.M.W.

been increased from 195 to 207 cu. in., to assure adequate power when operating on a lower grade of gasoline. This as well as a number of other German cars are now equipped with "octane selectors." All German cars must now be designed to run satisfactorily on 74 octane fuel, but by equipping them with octane selectors they can be operated to advantage also on fuels of higher octane number. The four-speed transmission of this model is synchronized in all speeds and is combined with an automatic overdrive developed by the Zahnradfabrik Friedrichshafen, which permits of driving the car steadily at its former top speed of 78.5 m.p.h. A water thermometer has been added to the equipment.

The Mercedes eight-cylinder mod-

competition of the Volkswagen shall begin to make itself felt. The channel-section side members of the frame, which formerly ran parallel only a short distance apart, are now about the normal distance apart in front, but come together at a point over the rear axle. This permits of securing the floor to the under side of the side channels, thus increasing the headroom. These cars now come with the same front suspension as all other Auto Union cars, comprising a single cross spring in combination with wishbone-type links. They are equipped with either 36.5- or 42.5-cu. in. two-stroke engines of 18- and 20-hp. rating, have front-wheel drive, and are now steered through toothed racks and divided tie rods. Other new features of these cars

How Much Can Be Gained By "Ramming" an Engine?

By P. M. HELDT

THE question often arises, especially in connection with the development of racing engines, as to how much power can be gained by turning the carburetor air-inlet pipe forward in the direction of motion and possibly providing it with a scoop or entrance cone. Owing to the inertia of the air, a certain ramming effect must be produced when the carburetor inlet is arranged in this manner, but very little data have been published on the subject, and little seems to be known as to the magnitude of the effect. That it is worthwhile where high speeds are attained seems to be indicated by the fact that aircraft engines generally are provided with such ramming inlet tubes. Of course, modern aircraft travel at speeds of 200 m.p.h. and over, and as the ramming effect varies as the square of the speed, it may be worthwhile on aircraft engines and still negligibly small on automobiles at normal touring speeds. Some light is being thrown on this question by a recent publication of the National Advisory Committee for Aeronautics, entitled "Wind-Tunnel Tests of Carburetor Intake Rams," by Frank H. Highley.

Mr. Highley discusses two types of rams, those located inside the cowling of radial aircraft engines and those located outside the cowling. These are again divided into two sub-types according to whether the section of the ramming tube is uniform or whether the tube is contracted at the inlet, the former being referred to as constant-area rams and the latter as expanding rams. With the constant-area rams, owing to the fact that the air velocity at the carburetor inlet is less than the slipstream velocity, upon entering the ram the velocity of the air must be reduced from that of the slip stream to that of the carburetor, and this creates a counter pressure and causes air to spill over the edges of the inlet to the ram. If the section of the ramming tube increases immediately behind the inlet, then

the decrease in the velocity of the air can be taken care of by expansion and there need be no spilling of air over the edges. It was found in the experiments at the N.A.C.A. Laboratory that the expansion types of ram were the most efficient.

As a result of ramming there is an increase in the total pressure head at the entrance to the carburetor, and in the discussion of the experimental results obtained by the N.A.C.A. this increase in pressure head is designated by p . The dynamic head due to the velocity of the air of the slip stream is designated by q . The increase in the pressure head would be expected to be substantially equal to the dynamic pressure of the slip stream. However, there is a certain loss due to friction in the ramming tube, and another loss due to entrance conditions. With the expansion-type of ramming tube these losses practically disappeared and the ratio of p/q had a value of about 1.01. With the constant-area ram the ratio p/q varied with the ratio V_r/R , where V_r is the velocity at the carburetor and V the velocity of the slip stream. Tests were made also with the inlet to the ram directly behind the propeller. Evidently the air velocity directly behind the propeller was considerably greater than the velocity of the slip stream, and in that case the ratio p/q for the expanding type of ram had a constant value of 1.175.

It would thus seem that if a ramming tube were used for the air intake of the carburetor on an automobile, of the expansion type, and were carried outside the hood, a ramming pressure about equal to the dynamic pressure of the air in the slip stream could be figured with. This dynamic pressure can be arrived at as follows:

The kinetic energy of a mass of air of weight W is $Wv^2/2g$ ft.-lb., where v is the velocity of the air in ft. per sec. and g the constant of gravity, viz., 32.16 ft. per sec.². Now assume a frontal area of 1 sq. ft. section. Let the speed of the vehicle

be V m.p.h., then $v = 1.466$ ft. per sec. and the volume of air whose kinetic energy is being dissipated in one second is $1.466 V$ cu. ft. One cu. ft. of air at normal temperature and pressure weighs 0.0764 lb. and the weight of the air whose kinetic energy is dissipated in one second therefore is $0.0764 \times 1.466 V$ cu. ft. The kinetic energy of this air is

$$0.0764 \times 1.466 V \times 1.466^2 V^2$$

$$2 \times 32.16$$

Now, the kinetic pressure is dissipated in overcoming a certain force or pressure through a certain distance, and the energy is equal to the product of the pressure and the distance through which it is overcome. The distance is that through which the vehicle moves in one second, viz., $1.466 V$, and to get the pressure we divide the energy by $1.466 V$, which gives

$$0.0764 \times 1.466 V \times 1.466^2 V^2$$

$$\frac{2 \times 32.16 \times 1.466 V}{0.0764 \times 1.466^2 V^2} =$$

$$\frac{2 \times 32.16}{V^2/391 \text{ lb. per sq. ft.}}$$

$$= V^2/56,300 \text{ lb. per sq. in.,}$$

where V is the car speed in m.p.h.

Therefore, at a speed of 60 m.p.h. a ramming pressure of

$$60 \times 60$$

$$= 0.064 \text{ lb. per sq. in.}$$

$$56,300$$

may be expected under the most favorable conditions. At 30 m.p.h. the ramming pressure would be only one-fourth as great, that is 0.016 lb. per sq. in., and at the conventional touring speed of 45 m.p.h. it would be equal to about 0.035 lb. per sq. in.

As the normal atmospheric pressure is 14.7 lb. per sq. in., an increase in the pressure head at the carburetor inlet of 0.064 lb. per sq. in. amounts to a gain of only

$$100 \times 0.064$$

$$14.5$$

$$= 0.44 \text{ or less than}$$

one half of one per cent.
There has been a general impression
(Turn to page 407 please)

AMERICAN STOCK

MAKE AND MODEL	Designed For	No. of Forward Speeds	Direct Drive On	GEAR RATIOS (to —1)							BEARINGS			Inside Distance Between Bearings on Mainshaft (In.)	Distance Between Center Lines of Main and Countershaft (In.)	Type of Direct Drive Clutch	TYPE OF GEAR			
				Low	Second	Third	Fourth	Fifth	Reverse	Overdrive	Type	Mainshaft	Pilot				Countershaft	Low	Second	Third
Brown-Lipe	221	T.Tr	2	1	1.00					.75	Con	Ball	Rol	Rol		4.00	G-T	Dir	Sp	
Brown-Lipe	222	T.Tr	2	2	1.52	1.00					Con	Ball	Rol	Rol		4.00	G-T	Sp	Dir	
Brown-Lipe	231	T.Tr	2	2	1.52					.75	Con	Ball	Rol	Rol		4.00	G-T	Dir	Sp	
Brown-Lipe	232	T.Tr	2	2	1.52					.75	Con	Ball	Rol	Rol		4.00	G-T	Sp	Dir	
Brown-Lipe	703	Trucks	3	2	2.62	1.00	.75				Cla	B&R	Ball	Ball	13½	7.00	G-T	Sp	Dir	
Brown-Lipe	1431	Buses	3	3	2.78	1.86	1.00		3.37		Con	Ball	Rol	Rol		4.09	G-T	Sp	Hi	Dir
Brown-Lipe	2341	T.B.Tr	4	4	6.27	3.04	1.65	1.00	7.53		C&C	Ball	Rol	B&R		4.21	G-T	Sp	Sp	
Brown-Lipe	3221	T.Tr	2	1	1.00					.79	Con	Ball	Ball	Ball		4.75	G-T	Dir	Sp	Hi
Brown-Lipe	3222	T.Tr	2	2	2.15	1.00					Con	Ball	Ball	Ball		4.75	G-T	Hi	Dir	
Brown-Lipe	3241	Trucks	4	4	7.00	3.90	1.86	1.00	8.10		C&C	B&R	Rol	Ball		4.75	G-T	Sp	Sp	Hi
Brown-Lipe	3341	T.B	4	4	6.30	3.51	1.68	1.00	7.29		C&C	B&R	Rol	Ball		4.75	G-T	Sp	Sp	Hi
Brown-Lipe	3440	Trucks	4	3	3.87	1.86	1.00	.73	4.48	.73	C&C	B&R	Rol	B&R		4.75	G-T	Sp	Sp	Dir
Brown-Lipe	3481	Trucks	8	7	8.31	4.00	3.87	2.15	9.62	.73	C&C	B&R	Rol	Ball		4.75	G-T	Sp	Sp	Hi
Brown-Lipe	5031	Buses	3	3	4.03	1.98			4.96		C&C	B&R	Rol	Rol		4.25	G-T	Sp	Hi	
Brown-Lipe	5221	T.Tr	2	1	1.00	2.34					Con	Ball	Ball	Ball		5.50	G-T	Dir	Hi	
Brown-Lipe	5222	T.Tr	2	2	2.34	1.00					Con	Ball	Ball	Ball		5.50	G-T	Hi	Dir	
Brown-Lipe	5241	Trucks	4	4	7.15	3.45	1.83	1.00	8.13		C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Hi
Brown-Lipe	5251	Trucks	5	4	7.15	3.45	1.83	1.00	8.13	.80	C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Hi
Brown-Lipe	5331	Buses	3	3	3.72	1.88	1.00		4.21		C&C	Ball	Rol	Ball		4.75	G-T	Hi	Sp	Dir
Brown-Lipe	5341	T.B	4	4	6.63	3.20	1.70	1.00	7.53		C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Hi
Brown-Lipe	5351	Trucks	5	4	6.63	3.20	1.70	1.00	7.53	.74	C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Hi
Brown-Lipe	5352	Trucks	5	5	7.70	4.85	2.56	1.43	1.00	7.80	C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Sp
Brown-Lipe	5440	T.Tr	4	3	3.90	1.88	1.00	.75	4.43	.75	C&C	B&R	Rol	Ball		5.50	G-T	Sp	Sp	Dir
Brown-Lipe	6031	Trucks	3	2	2.22	1.00	.69			.69	Con	Rol	Rol	Rol		5.10	G-T	Hi	Hi	
Brown-Lipe	7131	Buses	3	3	3.80	1.74	1.00		3.41		C&C	Ball	Ball	Rol		6.50	G-T	Hi	Hi	
Brown-Lipe	7241	T.B.Tr	4	4	7.10	3.89	1.96	1.00	9.24		C&C	B&R	Ball	B&R		6.50	G-T	Sp	Sp	Hi
Brown-Lipe	7341	T.B.Tr	4	4	6.27	3.43	1.73	1.00	8.15		C&C	B&R	Ball	B&R		6.50	G-T	Sp	Sp	Hi
Brown-Lipe	7351	T.Tr	5	4	6.27	3.43	1.73	1.00	8.15	.67	Con	B&R	Rol	B&R		6.50	G-T	Sp	Sp	Hi
Brown-Lipe	7440	T.Tr	4	3	3.72	2.04	1.00	.77	4.84	.77	C&C	B&R	Ball	B&R		6.50	G-T	Sp	Sp	Dir
Brown-Lipe	2321	Trucks	2	1	1.00					.75	Con	B&R	Rol	Rol	57½	4.00	G-T	Hi		
Brown-Lipe	2323	Trucks	2	2	1.58	1.00					Con	Ball	Rol	Rol	57½	4.00	G-T	Hi		
Brown-Lipe	2441	Trucks	4	4	6.12	3.10	1.70	1.00	7.27		Con	Ball	Rol	B&R	91½	4.75	G-T	Hi	Hi	
Brown-Lipe	2452	Trucks	5	5	7.12	4.20	2.33	1.66	1.00	7.45	C&C	Ball	Rol	B&R	111½	4.75	G-T	Hi	Hi	Hi
Brown-Lipe	2453	Trucks	5	4	6.12	3.62	2.00	1.00	6.40	.80	C&C	Ball	Rol	B&R	111½	4.75	G-T	Hi	Hi	Hi
Clark	187F	Tractors	4	4	5.00	2.61	1.89	1.00	5.94		C&C	Ball	Rol	B&R	91½	4.33	G-T	Sp	Sp	Hi
Clark	140T	Trucks	3	3	3.46	1.71	1.00		4.25		C&C	Ball	Rol	Rol	71½	3.35	G-T	Sp	Hi	Dir
Clark	204V	T.B	5	5	7.58	4.38	3.05	1.72	1.00	7.51	C&C	Ball	Rol	B&R	125½	4.75	G-T	Sp	Sp	Hi
Clark	204VO	T.B	5	4	6.06	3.50	1.80	1.00	6.00	.80	C&C	Ball	Rol	B&R	125½	4.75	G-T	Sp	Sp	Hi
Clark	272V	T.B	5	5	7.88	4.46	3.09	1.74	1.00	(a)	C&C	Ball	Rol	B&R	133½	5.50	G-T	Sp	Sp	Hi
Clark	272VO	T.B	5	4	7.00	3.97	1.81	1.00		(b)	C&C	Ball	Rol	B&R	133½	5.50	G-T	Sp	Sp	Hi
Clark	326V	T.B	5	5	8.05	4.34	2.71	1.67	1.00	(c)	C&C	Ball	Rol	B&R	153½	5.90	G-T	Sp	Sp	Hi
Clark	326VO	T.B	5	4	6.51	3.51	1.75	1.00		(d)	C&C	Ball	Rol	B&R	153½	5.90	G-T	Sp	Sp	Hi
Cotta		A	4	4	5.20	3.68	1.85	1.00	4.66		Con	Ball	Rol	B&G	122½	4.50	Jaw	Sp	Sp	
Cotta		FA	3	3	4.00	2.00	1.00		4.12		Con	Ball	Rol	B&G	162½	6.75	Jaw	Sp	Sp	
Cotta		FAA	1-2	2	4.75	1.00			4.12		Con	Ball	Rol	B&G	82½	6.75	Jaw	Sp	Sp	
Cotta		JR	1	1						1.00	Con	Ball	Rol	Rol	53½	4.50	Jaw	Sp	Sp	
Cotta		RAU	3	3	3.68	1.85	1.00		4.66		Con	Ball	Rol	Ball	112½	4.90	Jaw	Sp	Sp	Sp
Cotta		SAU	3	3	3.68	1.85	1.00		4.66		Con	Ball	Rol	Ball	13	5.40	Jaw	Sp	Sp	Sp
Cotta		TAU	3	3	5.20	2.50	1.00		4.66		Con	Ball	Rol	Ball	141½	6.00	Jaw	Sp	Sp	Sp
Cotta		T	4	4	5.20	3.68	1.85	1.00	4.66		Con	Ball	Rol	Ball	181½	6.00	Jaw	Sp	Sp	Sp
Cotta		TS	1-2	1	5.20	1.00			4.66		Con	Ball	Rol	Ball	71½	6.00	Jaw	Sp	Sp	
Cotta		ZA	3	3	2.88	1.56	1.00		4.66		C&C	Ball	Rol	Ball	14	5.50	G-T	Sp	Sp	Sp
Cotta Gear		45U-5	5	5	8.50	4.63	2.92	1.59	1.00	(h)	Con	Ball	Ball	B&G	109½	4.50	Jaw	(Sp or He)		
Fuller	5A-620, 5F-620	T.B	5	4	7.07	3.50	1.72	1.00		(e)	C&C	Ball	Rol	B&R	151½	5.83	G-T	Sp	Sp	Hi
Fuller	5-M-620	T.B	5	4	7.07	3.50	1.72	1.00		(e)	C&C	Ball	Rol	B&R	151½	5.83	G-T	Sp	Sp	Hi
Fuller	8-A-86, 8-AM-86	T	8	8	14.83	7.42	6.54	3.99	3.27(j)	(k)	C&C	Ball	Ball	Ball	26½	6.10	G-T			
Fuller	8-B-86, 8-BM-86	T	8	8	12.56	7.42	5.54	3.99	3.27(j)	(l)	C&C	Ball	Ball	Ball	26½	6.10	G-T			
Fuller	8-A-860, 8-AM-860	T	8	7	8.44	4.22	3.72	2.27	1.86(m)	(n)	C&C	Ball	Ball	Ball	26½	6.10	G-T			
Fuller	8-B-860, 8-BM-860	T	8	7	7.14	4.22	3.15	2.27	1.86(m)	(o)	Con	Ball	Ball	Ball	26½	6.10	G-T			
Fuller	UR & AR-1.63	Trucks	2	2	1.63	1.00				.76	C&C	Ball	Rol	Ball	5.52	4.90	G-T	Sp	Dir	
Fuller	2-A-53	Trucks	2	2	2.08	1.00				No	Con	Ball	Roller	Ball	5.09	5.83	G-T	He	Dir	
Fuller	2-B-53	Trucks	2	2	1.33	1.00				No	Con	Ball	Roller	Ball	5.09	5.83	G-T	He	Dir	
Fuller	3-A-96	Trucks	3	2	1.99	1.00				No	Con	Ball	Ball	Ball	15.47	6.10	G-T	He	Dir	He
Fuller	4-A-86, 4-AM-86	T.B	4	4	6.54	3.27	1.76	1.00	7.24	.76	C&C	Ball	Rol	Ball	14.95	6.10	G-T	Sp	Hi	Dir
Fuller	4-A-860, 4-AM-860	T.B	4	3	3.72	1.86	1.00		4.11		C&C	Ball	Rol	Ball	14.95	6.10	G-T	Sp	Hi	
Fuller	4-B-86, 4-BM-86	T.B	4	4	5.54	3.27	1.76	1.00	6.58		C&C	Ball	Rol	Ball	14.95	6.10	G-T	Sp	Hi	Hi
Fuller	5-A & B-33, 5-M-33	T.B.Tr	5	5	7.53	4.30	2.52	1.42	1.00	7.37	C&C	Ball	Rol	B&R	12.02	4.50	G-T	Sp	Sp	Hi
Fuller	5-A & B-330, 5-M-330	T.B.Tr	5	4	6.10	3.48	2.04	1.00	5.96	.76	C&C	Ball	Rol	B&R	12.02	4.50	G-T	Sp	Sp	Hi
Fuller	5-A & F-43, 5-M-43	T.B	5	5	8.03	4.61	2.46													

TRANSMISSIONS

TEETH USED FOR				GEAR TOOTH PITCH								MATERIALS			Control Location	Sold with Clutch	BRAKE			Recommended Type of Lubricant	MAKE AND MODEL	
Fourth	Fifth	Reverse	Countershaft Drive	Low	Second	Third	Fourth	Fifth	Reverse	Countershaft Drive	Housing	Shaft, S.A.E. No.	Gear, S.A.E. No.				Diameter (In.)	Width (In.)	Weight (Lb.)			
		Sp		6	6					6	CI	3115	4620	SI					95	Oil	Brown-Lipe	221
				6	6					6	CI	3115	4620	SI					95	Oil	Brown-Lipe	222
				6	6					6	CI	3115	4620	Re	No		9 1/2		105	Oil	Brown-Lipe	231
				6	6					6	CI	3115	4620	Re	No		9 1/2		105	Oil	Brown-Lipe	232
											CI	3115	4620	Re	No		No		355	Oil	Brown-Lipe	703
Dir		Sp	HI	6-8	7					6-8	CI	4615	4620	Ce	Op					Oil	Brown-Lipe	1431
				7-9	7-9	7				7-9	CI	3115	4620	Ce	Op				127	Oil	Brown-Lipe	2341
				6						6	CI	4615	4620	Ce	Op				135	Oil	Brown-Lipe	3221
HI		Sp	HI	6-8	6-8	7	7			6-8	CI	4615	4620	Ce	Op				135	Oil	Brown-Lipe	3222
HI		Sp	HI	6-8	6-8	7	7			6-8	CI	4615	4620	Ce	Op				225	Oil	Brown-Lipe	3241
HI		Sp	HI	6-8	6-8	7	7			6-8	CI	4615	4620	Ce	Op				225	Oil	Brown-Lipe	3341
HI	HI	Sp	HI	6-8	6-8	6-8	7			6-8	CI	4615	4620	Ce	Op	8	2 1/2		225	Oil	Brown-Lipe	3440
		Sp	HI	6-8	7					6-8	CI	4615	4620	Ce	Op				360	Oil	Brown-Lipe	3481
				6							AI	4615	4620	SI	Op					Oil	Brown-Lipe	5031
											CI	4615	4620	Ce					190	Oil	Brown-Lipe	5221
											CI	4615	4620	Ce					190	Oil	Brown-Lipe	5222
HI	HI	Sp	HI	6-8	6-8	6				6-8	CI	4615	4620	Ce	Op				320	Oil	Brown-Lipe	5241
HI		Sp	HI	6-8	6-8	6		6		6-8	CI	4615	4620	Ce	Op				410	Oil	Brown-Lipe	5251
		Sp	HI	6	6					6	CI	4615	4620	SI	Op					Oil	Brown-Lipe	5331
HI		Sp	HI	6-8	6-8	6				6-8	CI	4615	4620	Ce	Op				320	Oil	Brown-Lipe	5341
HI	HI	Sp	HI	6-8	6-8	6				6-8	CI	4615	4620	Ce	Op				410	Oil	Brown-Lipe	5351
HI	HI	Sp	HI	6-8	6-8	6-8	8			6-8	CI	4615	4620	Ce	Op				410	Oil	Brown-Lipe	5352
HI	HI	Sp	HI	6-8	6-8	6-8				6-8	CI	4615	4620	Ce	Op				320	Oil	Brown-Lipe	5440
		Sp	HI	5						6	AI	4615	4620	SC	Op				200	Oil	Brown-Lipe	6031
Dir		Sp	HI	5-7	5-7	6				5-7	AI	4615	4620	Ce	Op				480	Oil	Brown-Lipe	7131
Dir		Sp	HI	5-7	5-7	6				5-7	CI	4615	4620	Ce	Op				480	Oil	Brown-Lipe	7241
Dir	HI	Sp	HI	5-7	5-7	6				5-7	CI	4615	4620	Ce	Op				580	Oil	Brown-Lipe	7341
HI		Sp	HI	5-7	5-7	6				5-7	CI	4615	4620	Ce	Op				480	Oil	Brown-Lipe	7351
				6						6	CI	3115	4620	Re	No		9 1/2	3	105	Oil	Brown-Lipe	7440
Dir	Dir	HI	HI	6-8	6-8	7	7			7	CI	3115	4620	CR	Op		9 1/2	3	168	Oil	Brown-Lipe	2321
				6-8	6-8	7	7			7	CI	3115	4620	CR	Op		9 1/2	3	105	Oil	Brown-Lipe	2323
Dir	HI	Sp	HI	6-8	6-8	7	7			7	CI	3115	4620	CR	Op		9 1/2	3	175	Oil	Brown-Lipe	2441
				6-8	6-8	7	7			7	CI	3115	4620	CR	Op		9 1/2	3	175	Oil	Brown-Lipe	2452
Dir		Sp	HI	Var	Var	Var	Var			Var	CI	4620	Var	Ce	No		No			Oil	Brown-Lipe	2453
		Sp	HI	7-9	8-10					8-10	CI	4620	Var	Ce	No		No			Oil	Brown-Lipe	187F
HI	Dir	Sp	HI								CI	4620	Var	Ce	No	7	2	Var	Var	Oil	Clark	140T
HI		Sp	HI								CI	4620	Var	CFR	No	9 1/2	3	Var	Var	Oil	Clark	204V
HI		Sp	HI								CI	4620	Var	CFR	No	9 1/2	3	Var	Var	Oil	Clark	204VO
HI		Sp	HI								CI	4620	Var	CFR	No	10 1/2	3	Var	Var	Oil	Clark	272V
HI		Sp	HI								CI	4620	Var	CFR	No	10 1/2	3	Var	Var	Oil	Clark	272VO
HI		Sp	HI								CI	4620	Var	CFR	No			Var	Var	Oil	Clark	326V
		Sp	HI								CI	4620	Var	CFR	No			Var	Var	Oil	Clark	326VO
		Sp									SS	3120°	3120	Ce	Op				165	NoF	Cotta	A
		Sp									SS	3120°	3120	Ce	Op				575	NoF	Cotta	FA
		Sp									SS	3120°	3120	Ce	Op				250	NoF	Cotta	FAA
		Sp									SS	3120°	3120	SI	Op				150	NoF	Cotta	JR
		Sp									SS	3120°	3120	Ce	Op				250	NoF	Cotta	RAU
		Sp									SS	3120°	3120	Ce	Op				325	NoF	Cotta	SAU
		Sp									SS	3120°	3120	Ce	Op				400	NoF	Cotta	TAU
Sp		Sp									SS	3120°	3120	Ce	Op				410	NoF	Cotta	T
		Sp									SS	3120°	3120	Ce	Op				210	NoF	Cotta	TS
		Sp									SS	3120°	3120	Ce	Op				325	NoF	Cotta	ZA
Dir	HI	Sp	HI	6-8	6-8	6-8	6-8	6-8	6-8	7-9	SS	2340	2320	Ce	No	No	No	No		Oil	Cotta Gear	45U-5
Dir	HI	Sp	HI	5-6	5-6	6-6.5	6-6.5	6-6.5	5-6	6-6.5	CI	(f)	(g)	F	No	No	No	No	385	Oil	Fuller	5A-620, 5F-620
		Sp	HI	5-6	5-6	6-6.5	6-6.5	6-6.5	5-6	6-6.5	No	(f)	(g)	Ce	No	No	No	No	320	Oil	Fuller	5-M-620
											CI	(f)	(g)	Ce	No	No	No	No	850°	Oil	Fuller	8-A-86, 8-AM-86
											CI	(f)	(g)	Ce	No	No	No	No	850°	Oil	Fuller	8-B-86, 8-BM-86
											CI	(f)	(g)	Ce	No	No	No	No	850°	Oil	Fuller	8-A-860, 8-AM-860
											CI	(f)	(g)	Ce	No	No	No	No	850°	Oil	Fuller	8-B-860, 8-BM-860
		Sp	HI	5-8	6-6.5					6-6.5	CI	(p)	(q)	Rr	No	No	No	No	150°	Oil	Fuller	UR & AR-1.63
		Sp	HI	6-6.9	6					6	No	(p)	(r)	Re	No	No	No	No	158	Oil	Fuller	2-A-53
		Sp	HI	6-6.9	6					6	No	(p)	(r)	Re	No	No	No	No	158	Oil	Fuller	2-B-53
		Sp	HI	4.5	5					5	No	(p)	(r)	Re	No	No	No	No	340	Oil	Fuller	3-A-96
Dir		Sp	HI	5-6	6-6.5	6-6.5	6-6.5	6-6.5	5-6	6-6.5	CI	(f)	(q)	Ce	No	No	No	No	420°	Oil	Fuller	4-A-86, 4-AM-86
HI		Sp	HI	5-6	6-6.5	6-6.5	6-6.5	6-6.5	5-6	6-6.5	CI	(f)	(q)	Ce	No	No	No	No	420	Oil	Fuller	4-A-860, 4-AM-860
Dir		Sp	HI	5-6	6-6.5	6-6.5	6-6.5	6-6.5	5-6	6-6.5	CI	(r)	(q)	CR	No	No	No	No	420°	Oil	Fuller	4-B-86, 4-BM-86
HI	Dir	Sp	HI	6-7	6-7	7-9	7-9	7-9	6-7	7-9	CI	(f)	(g)	CR	Op	8°	2 1/2	210°	Oil	Fuller	5-A & B-33, 5-M-33	
Dir	HI	Sp	HI	6-7	6-7	7-9	7-9	7-9	6-7	7-9	CI	(f)	(g)	Ce	Op	8°	2 1/2	210°	Oil	Fuller	5-A & B-330, 5-M-330	
HI	Dir	Sp	HI	6-7	6-7	6-6.9	6-6.9	6-6.9	6-7	6-6.9	CI	(f)	(g)	CFR	Op	10	3	330°	Oil	Fuller	5-A & F-43, 5-M-43	
Dir	HI	Sp	HI	6-7	6-7	6-6.9	6-6.9	6-6.9	6-7	6-6.9	CI	(f)	(g)	CFR	Op	10	3	330°	Oil	Fuller	5-A & F-430, 5-M-430	
HI	Dir	Sp	HI	5-6	5-6	6-6.5	6-6.5	6-6.5	5-6	6-6.5	CI	(f)	(g)	CFR	Op	No	No	370°	Oil	Fuller	5-A & F-62, 5-M-62	
Sp	Dir	Sp	Sp	5-7	5-7	5-7	5-7	5-7	5-7	5-7	SS	(v)	CN	CR	Op	No	No	No	496	Oil	FWD	5
Sp		Sp	Sp	6	6	6	6	6	6	6	CI	2312	(x)	Ce	No	No	No	No	180	Oil	Mann	200
Sp		Sp	Sp	5	5	5	5	5	5	5	CI	2315	(y)	Ce	No	No	No	No	360	Oil	Mann	300
Sp		Sp	Sp	5	5	5	5	5	5	5	CI	2312	(x)	Ce	No	No	No	No	360	Oil	Mann	300
		HI									CA	2312	(x)	Ce	No	No	No	No	360°	Oil	Mann	600
Dir		HI		6	6	6	6	6	6	6	AI	2312	(x)	Ce	No	No	No	No	285	Oil	Mann	600
Dir		HI		5	5	5	5	5	5	5	CA	2312	(x)	Ce	No	No	No	No	425°	Oil	Mann	700
		HI		5	5	5	5	5	5	5	SS	2312	(x)	Ce	No	No	No	No	925	Oil	Mann	900
Dir		Sp	HI	7.3	7.9	7.9	7.9	7.3	7.3	7.9	CI	4620	4620	CF	No	7	2	73	Oil	New Process	36710	
Dir		Sp	Sp	7-9	7	7	7	7-9	7-9	7	CI	5145	5145	CF	No	7 1/2	2	117 1/2	Oil	New Process	36750, 36760	
Dir		Sp	Sp	7	7	7-9	7-9	7-9	7-													

Torsional Vibration of Diesel

BY O. MALYCHEVITCH, A. E.

THE three-mass equivalent system is shown in Fig. 13 and the normal deflection curve of the six-cylinder crankshaft for second-mode vibration in Fig. 14. According to Equation (3) the torsional rigidities of the two shaft lengths in Fig. 13 are

$$M_a = \frac{GJ}{L_1} = \frac{12 \times 10^6 \times 8}{21.5} = 4.47 \times 10^6 \text{ lb-in. per radian}$$
$$M_b = \frac{GJ}{L_2} = \frac{12 \times 10^6 \times 8}{16} = 6 \times 10^6 \text{ lb-in. per radian}$$

(16)

The phase velocity for the three-mass system can be found from the following quadratic equation:

$$a\omega^4 - b\omega^2 + c = 0 \text{ or } \omega^2 =$$
$$\frac{b \pm \sqrt{b^2 - 4ac}}{2a}$$

After substituting the values for I , the moment of inertia, and M , the torsional rigidity, from Fig. 14 and Equation (16) we get

$$a = \frac{I_a I_b I_7}{M_a M_b} = 162 \times 10^{-16}$$
$$b = \frac{I_a I_b}{M_a} + \frac{I_a I_7}{M_a} + \frac{I_b I_7}{M_b} = 377 \times 10^{-8}$$
$$c = I_a + I_b + I_7 = 11.32$$

Substituting these values in the above equations we have:

$$162 \times 10^{-16} \omega^4 - 377 \times 10^{-8} \omega^2 + 11.32 = 0 \dots \dots \dots (17)$$
$$\omega_1^2 = 3,300,000 \text{ rad}^2\text{-sec.}^{-2} \text{ or } \omega_1 = 1800 \text{ radians per sec.}$$
$$f_1 = 17,200 \text{ cycles per min.}$$

$$\omega_2^2 = 19,734,000 \text{ rad}^2\text{-sec.}^{-2} \text{ or } \omega_2 = 4440 \text{ radians per sec.}$$
$$f_2 = 42,400 \text{ cycles per min.}$$

The two roots of Equation (17), ω_1 and ω_2 give us the approximate values of the frequencies for the first and second modes of vibration. The frequency of the first mode, $\omega_1 = 1800$ radians per sec., was found in the foregoing in solving for the frequency of the equivalent two-mass system. The approximate values of

ω_1 can be made use of in the calculation of Table I for the frequency of a seven-mass system representing the six-cylinder engine including the flywheel (Fig. 11).

We will try first the natural frequency $\omega_1^2 = 3,300,000 \text{ rad}^2 \text{ sec.}^{-2}$ and multiply this value by the inertia I (col. 5), which gives us the torque per unit of angular deflection of each mass in lb.-in. per radian. Column 7 gives the inertia torque of each mass in lb.-in. for an amplitude of one radian at mass No. 1. Column 8 gives the total torque in lb.-in., that is, the sum of the value in column 7 plus the previous value in column 8.

The value of the inertia torque of mass No. 6 in column 8 represents the sum of the torques of all discs to the left of the node, and must be equal to the inertia torque of the flywheel located to the right of the node. Then the last entry in column 8 will equal zero if the value assumed for the phase velocity ω_1^2 corresponds to the natural frequency. If $\omega_1^2 = 3,300,000 \text{ rad}^2\text{-sec.}^{-2}$ is too low, the value of the total torque in column 8 will be positive (as it is in our case). Suppose that in the next trial ω_1^2 is taken too high; then by interpolation we find that $\omega_1^2 = 3,700,000 \text{ rad}^2\text{-sec.}^{-2}$ will make the last torque equal to zero (col. 8). The corresponding frequency is given by Equation (2)

Four-Cylinder Engine				Frequency Calculation				TABLE IV			
				ONE-NODE VIBRATION				Figs. 17-18-19.			
$f = 26148 \text{ cycles per min.}$				$\omega^2 = 7,500,000 \text{ rad}^2\text{-sec.}^{-2}$							
1	2	3	4	5	6	7	8	9	10	11	12
Cyl. Mass No.	d	l	I	$I\omega^2$	ϵ	$I\omega^2\epsilon$	$\Sigma I\omega^2\epsilon$	$M = \frac{GJ}{l}$	$\frac{\Sigma I\omega^2\epsilon}{M}$	$I\epsilon^2$	S
			Eq. 14		Eq. 9			Eq. 3			Eq. 13
1	3	7	0.22	1.65×10^6	1.0000	1.65×10^6	1.65×10^6	13.7×10^6	0.1200	0.2200	≈ 5430
2	3	$7\frac{1}{2}$	0.22	1.65×10^6	0.8800	1.45×10^6	3.10×10^6	12.8×10^6	0.2400	0.1703	10250
3	3	7	0.22	1.65×10^6	0.6460	1.066×10^6	4.17×10^6	13.7×10^6	0.3050	0.0917	13700
4	3	8	0.22	1.65×10^6	0.3400	0.56×10^6	4.7×10^6	12×10^6	0.3950	0.0254	15300
FLY	.....	.....	11.5	86.2×10^6	-0.055	-4.7×10^6	0	.....	.....	0.0345	.....
										$\Sigma I\epsilon^2 = 0.5419$	.....

Engine Crankshafts

Part Two

Completing this treatise, Part One of which appeared in the March 18 issue of AUTOMOTIVE INDUSTRIES

HARMONIC ORDER	FIRING ORDER 1-4-2-6-3-5		CYL. NO.	FIRING ANGLE
	PHASE DIAGRAM	VECTOR DIAGRAM		
$\frac{1}{2}$ -2 $\frac{1}{2}$ -3 $\frac{1}{2}$ 5 $\frac{1}{2}$ -6 $\frac{1}{2}$ -8 $\frac{1}{2}$ 9 $\frac{1}{2}$ -11 $\frac{1}{2}$			1 2 3	0° 120 240
1-2-4-5 7-8-10-11			4 5 6	360 480 600
$1\frac{1}{2}$ -4 $\frac{1}{2}$ 7 $\frac{1}{2}$ -10 $\frac{1}{2}$				
3-6 9-12				

Table 5

$$f_1 = 9.55 \times 1923 = 18,440 \text{ cycles per min.}$$

The vibration amplitude in col. 6 represents a normal elastic curve EE (Fig. 11) with one node near the flywheel.

The phase velocity for two-note vibration (Figs. 13, 14, and 15, and Equation 17), was found to be $\omega_2^2 = 19,734,000 \text{ rad}^2\text{-sec.}^{-2}$, and the corresponding second natural frequency, $f_2 = 42,400 \text{ cycles per min.}$

Proceeding in the same manner we calculate the normal elastic curve for two-node vibration (Table II, col. 6). Having the data for the normal elastic curves for one- and two-node vibration (Tables I and II, col. 6), we can determine the vibration stress in each section of the shaft for a deflection of 1 deg. at cylinder No. 1 by means of Equation (13), which is represented in col. 12 of Tables I and II, and graphically in Figs. 12 and 15. The vibration stresses are a maximum at the nodes, their values being

$s = 10,850 \text{ lb. per sq. in.}$ for one-node vibration, and

$s = 32,000 \text{ lb. per sq. in.}$ for two-node vibration.

For two-node vibration the frequency $f = 51,500 \text{ cycles per min.}$, and for a maximum engine speed of 3000 r.p.m. the lowest harmonic

order that can come into resonance is the $51,500/3000 = 17\text{th}$, which is of no practical importance. Therefore, we will omit any further consideration of possible two-node vibration and proceed with the calculation of vibration stresses at resonance in one-node vibration. If there should be a possibility of resonance with harmonic orders of less than the twelfth, the stresses due to two-node vibration should be investigated.

Table V is a phase and vector diagram for six-cylinder four-stroke engines. The firing angles are shown in the last column, and the phase angle of any harmonic order is the product of the firing angle by the number of the order. In the phase diagrams 180 deg. corresponds to 360 deg. of crankshaft revolution.

The vector diagram is developed from the phase diagram. The values of the normal elastic curve given in Table I, col. 6, for each cylinder serve as the lengths of the corresponding vectors. The resultant of the force polygons gives the vector sum $\Sigma \epsilon$ for the various harmonic orders.

Inserting the values $\Sigma \epsilon$ from Table V in Table III, col. 16, and multiplying by the harmonic torque P , we have the resultant harmonic components of all cylinders (col. 17). The maximum stresses (col. 19) at

the node are the product of amplitude A by the maximum stress per degree of deflection at No. 1 cylinder given in col. 12 of Table I; $s = 10,850 \text{ lb. per sq. in.}$

The stress in the crankshaft opposite cylinder No. 4, for example, can be found by multiplying amplitude A by $s = 9100$, etc.

The maximum vibration stress S in lb. per sq. in., at the crankshaft node (Table III, col. 21) at resonance speed with hysteresis damping is the product of the magnification factor 8 (Table III, col. 20; also Equation 8) by Q (Table III, col. 19).

After plotting the values S (Table III, col. 21) on Fig. 16 for each harmonic order and critical speed at resonance speed with hysteresis damping, we have the magnitudes of torsional vibration stresses in lb. per sq. in. for the six-cylinder crankshaft with the firing order 1-4-2-6-3-5. We see that the only important critical is due to the sixth harmonic order, at 3000 r.p.m., and the stress induced by it is much above the safe stress and near the critical stress of 30,000 lb. per sq. in.; therefore, it is not advisable to run the engine at that speed in continuous service.

Critical speeds of the 9 and $7\frac{1}{2}$ order occur at 2000 and 2500 r.p.m. of the engine, but the stresses induced by them are within the critical stress limit. The stresses are based on the equivalent shaft diameter of 3 in., and it is obvious that if a smaller shaft were used, the stresses would be greater. For the firing order 1-5-3-6-2-4 the maximum stresses are the same for the major critical speeds, and differ only for the minor critical speeds; nevertheless, it must be kept in mind that the change in firing order of the engine may affect the torsional stresses and endanger the life of the shaft, especially in the case where the minor critical speeds are of importance. With an increase of the speed of the engine up to 6000 r.p.m., the stresses reach prohibitive figures; therefore, if it is required to run the engine at a higher speed for

deg. for the 10 order critical. Values of A_{max} are plotted in Fig. 20.

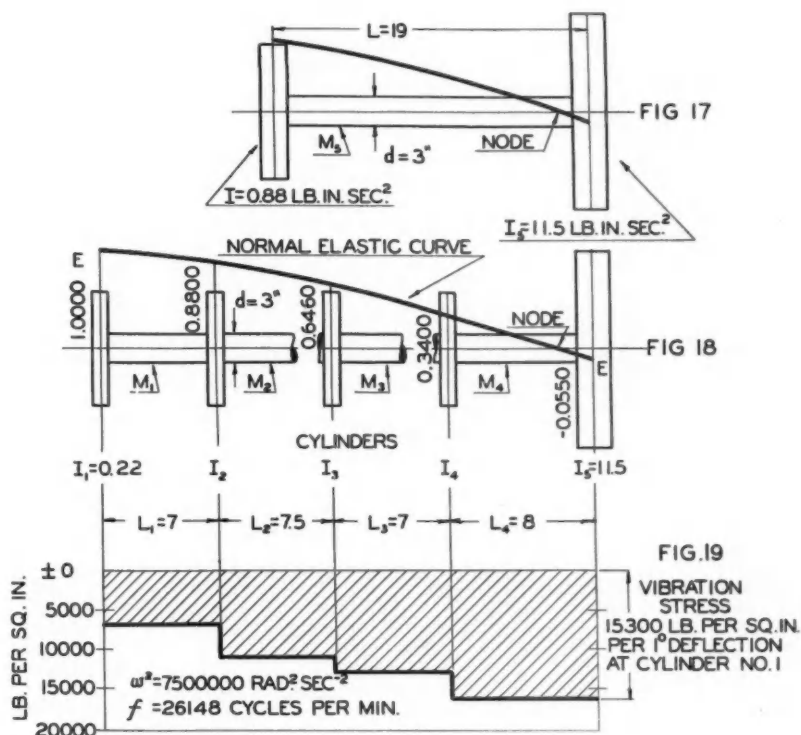
We note that the important critical for the four-cylinder engine is that corresponding to the sixth harmonic, at 4350 r.p.m., which is outside the operating speed range of the engine.

The calculated stresses are based on a shaft of 3 in. diameter, the same as for the six-cylinder engine; so, comparing Fig. 20 with Fig. 16, we find that the distribution of stress is more favorable in the four- than in the six-cylinder, which is due to the fact that the crankshaft length is less in the former. This does not mean, however, that for the same bore and stroke the crankshaft can be made of smaller diameter in the four-cylinder engine. The inherent roughness of the four-cylinder engine, due to the unbalanced secondary inertia force, often calls for a much heavier flywheel for tractor and industrial installations, and the larger flywheel increases the vibration stresses. The moment of inertia of the flywheel should not be more than 50 times the inertia of the moving parts of the individual cylinder.

Examining the normal elastic curve, we see that the amplitude of vibration of the flywheel is comparatively small, and we, therefore, cannot expect any noticeable change in frequency to result from increasing the moment of inertia of the fly-

wheel above normal. In comparing the shafts of the six- and four-cylinder engines, the former will show up to advantage because the moment of inertia of its rotating masses is smaller.

It is important to note that the operating speed of both engines is kept well below the critical speeds of the first to fourth harmonic orders. The reason for this is that at these critical speeds the inertia



Figures 17, 18, and 19

Four-Cylinder Engine

One-Node Frequency MAX. VIBRATION STRESSES AT RESONANCE SPEED WITH HYSTERESIS DAMPING

$f = 26148$ cycles per min.

$\omega^2 = 7,500,000 \text{ rad}^2\text{-sec.}^{-2}$

TABLE VI
Firing Order: 1-2-4-3
I.M.E.P. = 100 lb. per sq. in

13	14	15	16	17	18	19	20	21	22
Harmon Order K	Critical Speed R.P.M. $f : K$	P Fig. 9ab	$\Sigma \epsilon$ Table VII	$P\Sigma \epsilon$	A Eq. 19	Q $15300 \times A$	γ Eq. 8	S	$A^\circ \text{ max.}$ Eq. 19
4	6537	15.00	2.8460	42.600	± 0.015000	± 229.50	139	± 32000	± 2.10
4½	5800	10.10	0.6875	6.875	0.002400	36.70	346	12600	0.83
5	5250	8.00	0.1860	1.500	0.000500	7.65	780	5950	0.39
5½	4750	6.00	0.6875	4.140	0.001400	21.40	458	9800	0.64
6	4350	4.65	2.8460	13.200	0.004600	70.40	253	17800	1.16
6½	4000	3.50	0.6875	2.400	0.000840	12.85	600	7700	0.50
7	3750	2.80	0.1860	0.520	0.000180	2.75	1620	4450	0.29
7½	3500	2.50	0.6875	1.710	0.000600	9.20	700	6400	0.42
8	3280	1.60	2.8460	4.550	0.001600	24.50	430	10500	0.69
8½	3100	1.50	0.6875	1.030	0.000400	6.12	840	5120	0.34
9	2900	1.10	0.1860	0.200	0.000070	1.07	2100	2200	0.15
9½	2750	0.90	0.6875	0.620	0.000200	3.06	1220	3660	0.24
10	2614	0.70	2.8460	2.000	0.000700	10.70	655	7000	0.46
10½	2500	0.60	0.6875	0.410	0.000140	2.14	1500	3200	0.21
11	2380	0.50	0.1860	0.093	0.000032	0.49	3000	1470	0.10
11½	2280	0.40	0.6875	0.270	0.000090	1.38	2000	2760	0.18
12	2170	0.33	2.8460	0.940	0.000330	5.05	940	4750	0.31

How Much Can Be Gained by "Ramming" an Engine?

(Continued from page 399)

sion in the past that the ramming effect would be a maximum if the ram were provided with a horn, or scoop, which would scoop up air and produce an additional ramming effect. From the results of the N.A.C.A. it would seem that the very opposite is the case and that the inlet to the ramming tube, instead of being expanded trumpet-like, should be contracted. This, of course, is on the supposition that the air velocity in the carburetor inlet pipe is less than the slip-stream velocity. In an automobile, however, the air velocity in the inlet pipe is considerably greater than the velocity of the vehicle. For instance, in a popular low-priced car the car speed in direct drive at the peaking speed of the engine is 5500 ft. per min., whereas if we assume the volumetric efficiency of the engine to be 70 per cent, the air velocity at the carburetor inlet is 16,500 ft. per min. or just three times as high. The flying speeds of modern aircraft are just about three times as high as the top speeds of modern low-priced cars, and in aircraft the carburetor and inlet passages are made relatively large to be able to get high outputs from the engines. It seems, therefore, reasonable to expect an increase in the ramming effect from a horn or entrance cone. For instance, if the air velocity at the carburetor entrance had to be three times the velocity of the vehicle, the entrance cone could be made with an area of opening three times as large as that of the carburetor inlet, and if the angle of the cone were made sufficiently small, there would be no pressure rise at the entrance and no consequent spilling of air over its edges.

Ramming of the carburetor would certainly seem to be worthwhile in the case of racing and record machines, such as Captain Eyston's Thunderbolt, for at 315 m.p.h. the dynamic pressure of the air is approximately 1.75 lb. per sq. in. Of course, the engines of such cars are usually supercharged, but the ram can be used also with the supercharger, and will then reduce the power required to drive the latter for a given ratio of supercharge.

A new method of securing cylinder heads of air-cooled aircraft engines to the cylinders has been patented in England by the Skoda Works of Czechoslovakia. These heads are usually screwed and shrunk on. In the Skoda design the

top end of the cylinder is externally threaded, as usual, and a ring nut is provided. This ring nut has an internal offset or shoulder, and a turned flange on the cylinder head is clamped between the end of the cylinder and the offset in the bore of the ring nut.

THE Bristol Aeroplane & Motor Co., Bristol, England, announces the going into production of the Perseus X engine described as the first highly supercharged sleeve-

valve aero engine. It is quite similar to the Perseus XII, details of which were released last year, but the supercharger has an impeller of larger diameter and turns at higher speed. In a special 50-hr., weak-mixture test the fuel consumption was 0.448 lb. per b.h.p.-hr., at an output of 520 b.p.h. The new design is a nine-cylinder, air-cooled, radial, sleeve-valve engine of 5¾ in. bore by 6½-in. stroke and 1520 cu. in. displacement. Its maximum output is 880 hp. at 15,500 ft. altitude.

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BERLIN SHOW

(Continued from page 398)

front drive, the 61-cu. in. front drive (both with four-cylinder L-head engines) and the 152-cu. in. six cylinder. In the 61-cu. in. the combustion chamber form has been improved, the front shock absorbers have been raised to increase the

ground clearance, and the speedometer has a larger dial. In the 122-cu. in. model the oil pressure relief valve has been increased in size, for better control of the oil pressure; the three-way cock controlling the reserve compartment in the fuel tank (front

tank) is now mounted on the instrument board, and the electric cables are now of different colors, to facilitate tracing troubles in the circuits. The windshield is now of V type. The six-cylinder model is now equipped with an oil cooler located in the top tank of the radiator. Bodies of this model have been improved by providing wheel covers for the rear wheels. The fuel filler is now on the right rear fender and there is a three-way fuel valve let into the floor at the driver's seat. An oil thermometer is an additional fitting on the instrument board. This 58-hp. car is said to have a maximum speed of 78 m.p.h. and a cruising or sustained speed of 72 m.p.h.

The two Ford models, a four-cylinder 73-cu. in. of 34-hp. rating, and the V-8 of 90 hp., have had changes made in the crankshaft, the rear bearings now being larger, so that all bearings (which are of the steel-back, silver-cadmium type) are now interchangeable. Piston pins are now prevented from drifting by snap rings in grooves in the piston bosses. On the V-8 the interrupter has two springs and interchangeable contacts. This engine now is fitted with a Solex downdraft carburetor claimed to give greater power and better fuel economy. The tubular propeller shaft has been replaced by a solid one which is supported in the propeller-shaft tube at the middle of its length by a roller bearing mounted in rubber. The steering gear is now of the worm-and-roller instead of the worm-and-sector type, and the reduced friction loss has permitted of decreasing the gear ratio by 8 per cent. The mechanical brakes now have servo action.

Of the Hansa cars, now known as the Borgward, only the six-cylinder 122-cu. in. remains. Instead of the box-section backbone frame, a frame with two box-section side members of less depth is now used. These are drawn in at the middle, as in the two small Mercedes-Benz models, and open up at the front to receive the powerplant. The single transverse spring at the rear, mounted on top of the differential housing, connects with its ends to the axle tubes through rubber "turret" springs acting as supplementary springs. The floor of the car is entirely flat and the tubes of the chassis lubrication system are now located above the frame.

Hanomag exhibited its new 79-cu. in. model, described in *AUTOMOTIVE INDUSTRIES* of Feb. 4, and also its older 140-cu. in. six-cylinder model. Maybach this year showed only its 140-hp. car, in the engine of which the original leaf-type valve springs

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have been replaced by dual coil springs. Steyr, now a German make, exhibits only its 140-cu. in. cars, and it seems that the 61-cu. in. model of this make is doomed. Likewise Stoeber has a curtailed line, exhibiting only the four-cylinder Sedina and the six-cylinder Arkona, both with the same bore and stroke and many parts interchangeable between them. This firm has been building an air-cooled 91-cu. in. car under Tatra license, and it is understood that this is still on the market, but it was not shown, and its production probably will be discontinued.

Last to be mentioned, but by no means of least interest among the exhibits, is the Tatra, which is now a German make. This firm, it appears, will retain only a single model, the rear-engined V-8 air-cooled one which has been on the market since 1934 and has been exceptionally successful. The model exhibited is known as the "87," which has a piston displacement of 183 cu. in. and develops 75 hp. As the body is thoroughly streamlined, this power suffices to give it a speed of 100 m.p.h., though the weight of the car is slightly over 4000 lb. The body seats five comfortably. Hydraulic four-wheel brakes and centralized chassis lubrication are among the mechanical features. The wheels carry 6.50/16-in. tires and the final-drive ratio is 3.00.

I have not mentioned the Opel, as the products of this company were described at length in *AUTOMOTIVE INDUSTRIES* of January 21. Also, the non-German makes on display need be only mentioned, as most of them have been covered in connection with other shows; they included the Alfa-Romeo, Austin, Bugatti, Ceskomoravska (Praga) Fiat, Hillman, Hudson, Lancia, Renault and Sunbeam-Talbot.

Torsional Vibration of Diesel Crankshafts

(Continued from page 406)

6. TIMOSHENKO, S.—Vibration Problems in Engineering. D. Van Nostrand Co., N. Y.

7. DOREY, S. F.—Elastic Hysteresis in Crankshaft Steel. *Trans. Inst. Mech. Engrs.*, London, 1932, Vol. 123.

8. PORTER, F. P.—The Range and Severity of Torsional Vibration in Diesel Engines. *Trans. A.S.M.E.*, Paper APM-50-14, 1928.

9. DEN HARTOG, J. P.—Mechanical Vibrations. McGraw-Hill Book Co., N. Y.

10. WILSON, W. K.—Practical Solution of Torsional Vibration Problems. John Wiley & Sons, N. Y.

11. TUPLIN, W. A.—Torsional Vibration. John Wiley & Sons, N. Y.

12. GORNFINKEL, A.—Vibration de Torsion Dans les Moteurs Monocylindriques. *Génie Civil*, Nos. 21 and 22, May 26 and June 2, 1928.

13. FOX, J. F.—Torsional Vibration and Critical Speed in Crankshafts. *Jl. Soc. Aut. Engrs.*, November, 1920.

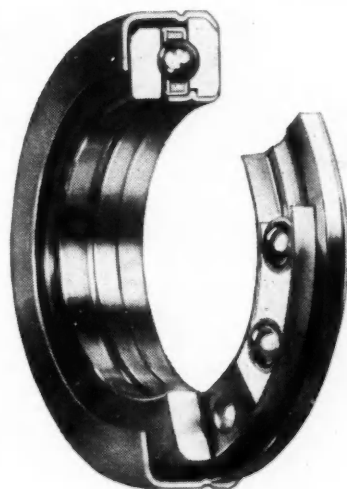
14. CONSTANT, H.—Stiffness of Multi-Throw Crankshafts. *Engineering*, Nov. 1, 1929.

THE Permanent Council of World's Petroleum Congresses met at Brussels recently under the chairmanship of M. Louis Pineaud. A new member present was Sig. Puppini, a delegate of Italian organizations. There was present also the president of the organizing committee of the Third World Petroleum Congress, which will be held in Berlin in June, 1940.



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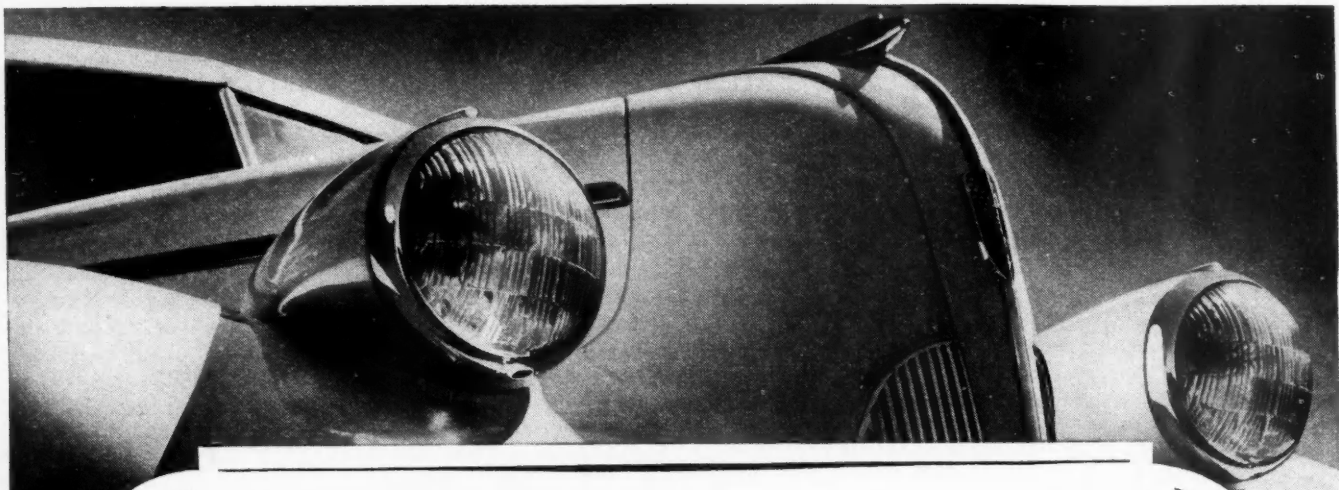


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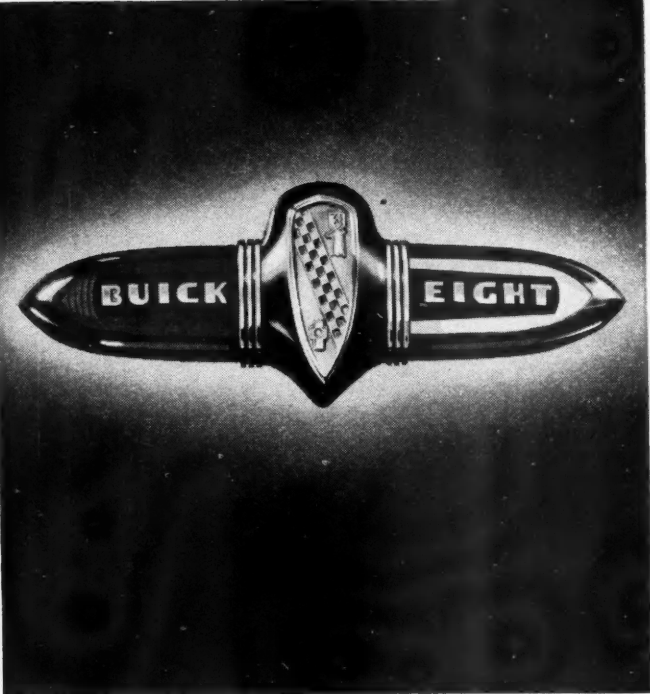
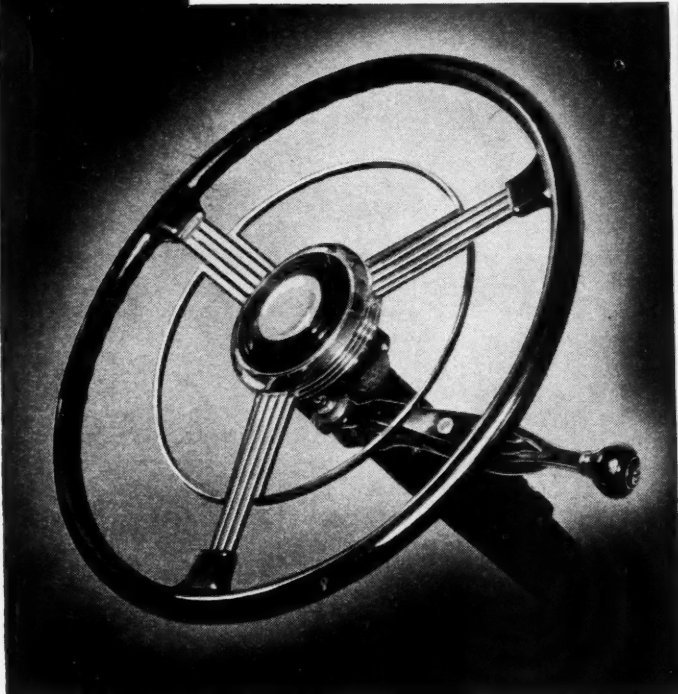
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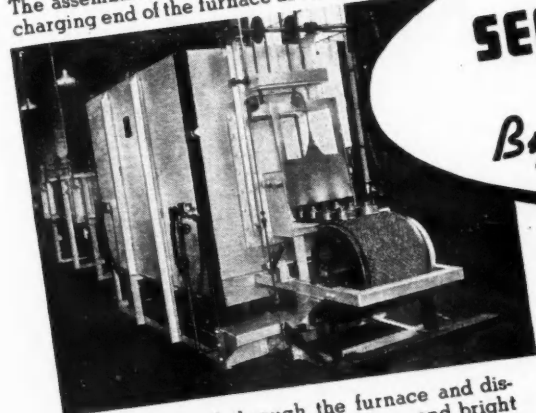
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